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FEBRUARY

Half-Pints' Express
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HOW TO SURVIVE A PLANE CRASH
BUILD A MODEL RACE CAR SEE PAGE 112

mechanix illustrated

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FEBRUARY, 1948 — VOL. XXXIX, NO. 4

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Engineer's Hydro-Magic Would Turn

Arid Palestine Into Fertile Farmland

American scientist says his plan would double the productivity of the Holy Land and give bountiful living to 2,000,000 additional Jews.

BY WILLY LEY

PALESTINE *can* support double its present population. The arid Holy Land could become a bountiful "Promised Land" for some 2,000,000 displaced persons, now starving in Europe's war ruins or huddled behind barbed-wire stockades in Germany and Cyprus.

But this can happen only if Palestine gets $250,000,000 for a project to water its barren lands. Right now, Palestine can't support a greater population than its current 600,000 Jews and 1,100,000 Arabs. Additional immigrants, such as the much-disputed 100,000-a-year quota, would only intensify its acute political and economic problems.

If Palestine should get as much water as its thirsty soil could drink, 4,000,000 people could flourish there in peace and prosperity, in contrast to the bleak outlook that now confronts most

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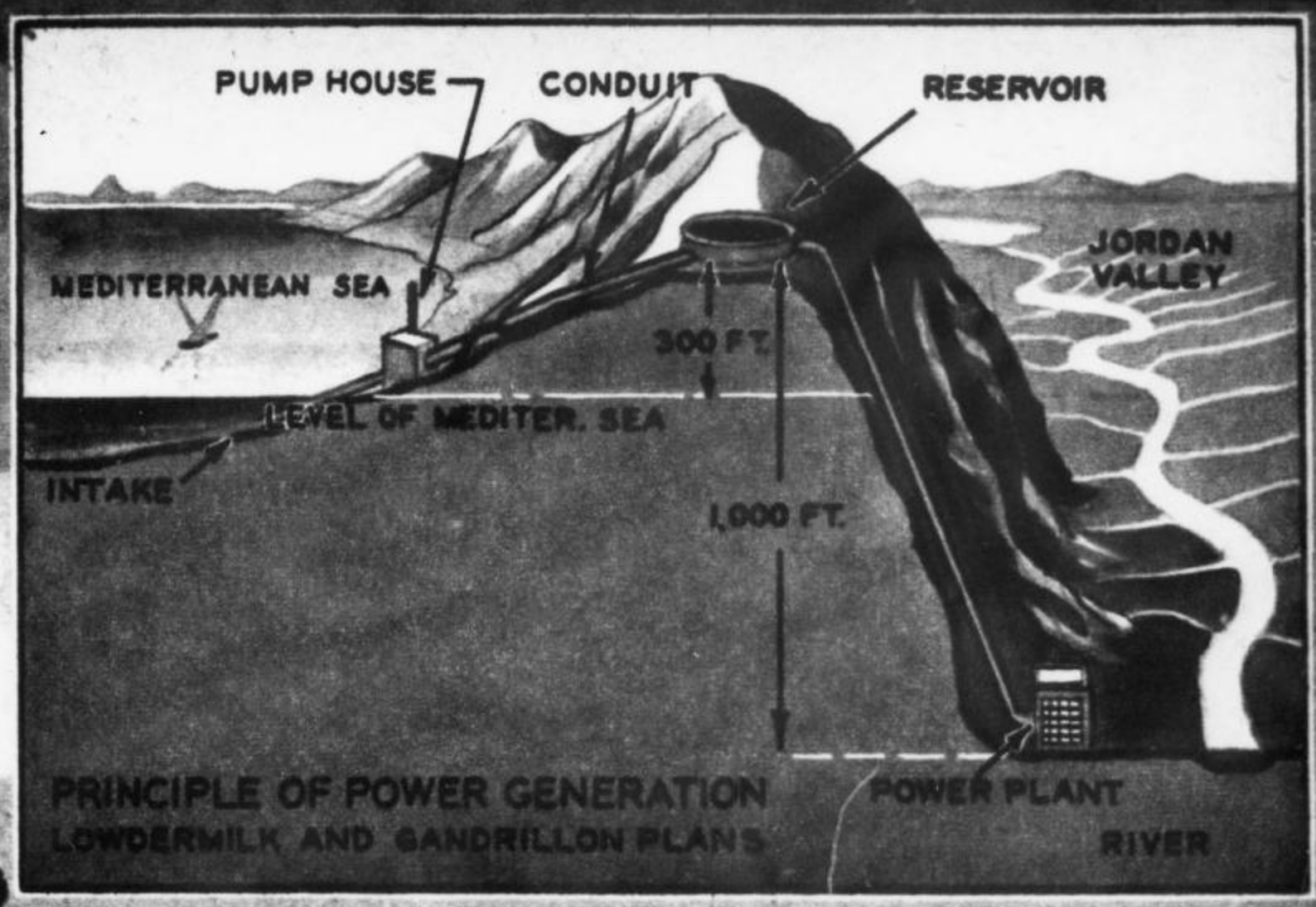


PRINCIPLE OF POWER GENERATION
LOWDERMILK AND GANDRILLON PLANS

T

RIFT VALLEY

TRANS-JORDAN

RIVER JORDAN

POWER PLANT N°1.

CANAL

POWER PLANT N°2

DEAD SEA

AS WATER DROPS 1,300 FEET INTO THE JORDAN VALLEY AND FLOWS THROUGH A NAVIGABLE CANAL TO THE SALTY DEAD SEA, IT OPERATES TWO POWER PLANTS, SUPPLYING ELECTRIC CURRENT TO OPERATE PUMPS AND MACHINERY.

JERUSALEM

DEAD SEA EVAPORATES 3,600 CUBIC FEET OF WATER EVERY SECOND. THIS LOSS WILL BE COMPENSATED FOR BY CANAL WATER WHICH WILL RAISE THE LEVEL OF THE SEA AND THE RIVER JORDAN WHICH FLOWS INTO IT, PROVIDING WATER FOR EVAPORATION TO INCREASE THE RAINFALL.

Turned back after their ship was captured, these refugees were imprisoned on Cyprus. Under the author's plan there would soon be room for them in the land of their choice.

Jewish farmers in the Negeo, watering their fields by means of a trailer-borne tank. The farming lands of agricultural Palestine are chronically water-thirsty.

of its 1,700,000 inhabitants. The problem is to engineer the reclamation of the land, badly neglected for centuries.

Hardly another spot on the globe is so made-to-order for modern engineering's hydro-magic as is Palestine. And there is no other spot on earth that needs such magic as badly as does this much-harassed Holy Land.

Dr. Walter Clay Lowdermilk, an American conservationist, has worked out a plan that can make Palestine's 9,000 square miles of semidesert bloom again with fertile farmland.

To understand the problem of reclaiming Palestine, first let's glance at its topography. The chief geographical feature of the land is the Jordan River Valley. Geologists call it a "rift valley"—a valley where large stretches of land have sunk far below the level of the surrounding countryside. The Dead Sea, into which the Jordan flows, is a part of the same line of geologic weakness.

For all its Biblical fame, the Jordan is not impressive. It is a slow and muddy stream in its lower reaches, and during the dry season can be forded at hundreds of places. The Jordan rises in the highlands of Lebanon several hundred feet above sea level and runs into the Dead Sea, 130 miles south on the map.

The first lake formed by the Jordan, Lake Huleh, is only slightly above sea level. The next lake to the south, Lake Tiberias, the Bible's Sea of Galilee, is 686 feet below sea level. Sixty-five miles farther south, the Jordan empties into the Dead Sea, which has sunk to 1,300 feet below the level of the Mediterranean. This deep Jordan Valley averages only 50 miles' distance from the Mediterranean and, near Lake Tiberias, lies only 30 miles away but across mountainous terrain.

Dr. Lowdermilk proposes to take advantage of the valley's unusual topography to make the Holy Land flourish again. He suggests that water be pumped from the Mediterranean near Haifa and forced into a canal across the mountains to the Dead Sea. Such a canal, he points out, could be the key to

More water will give the Holy Land far more groves, too—and modern methods.

Desert plus water equals rich farmland—as shown by this lettuce grown under irrigation in California. Irrigation in the U. S. is reclaiming vast areas of desert.

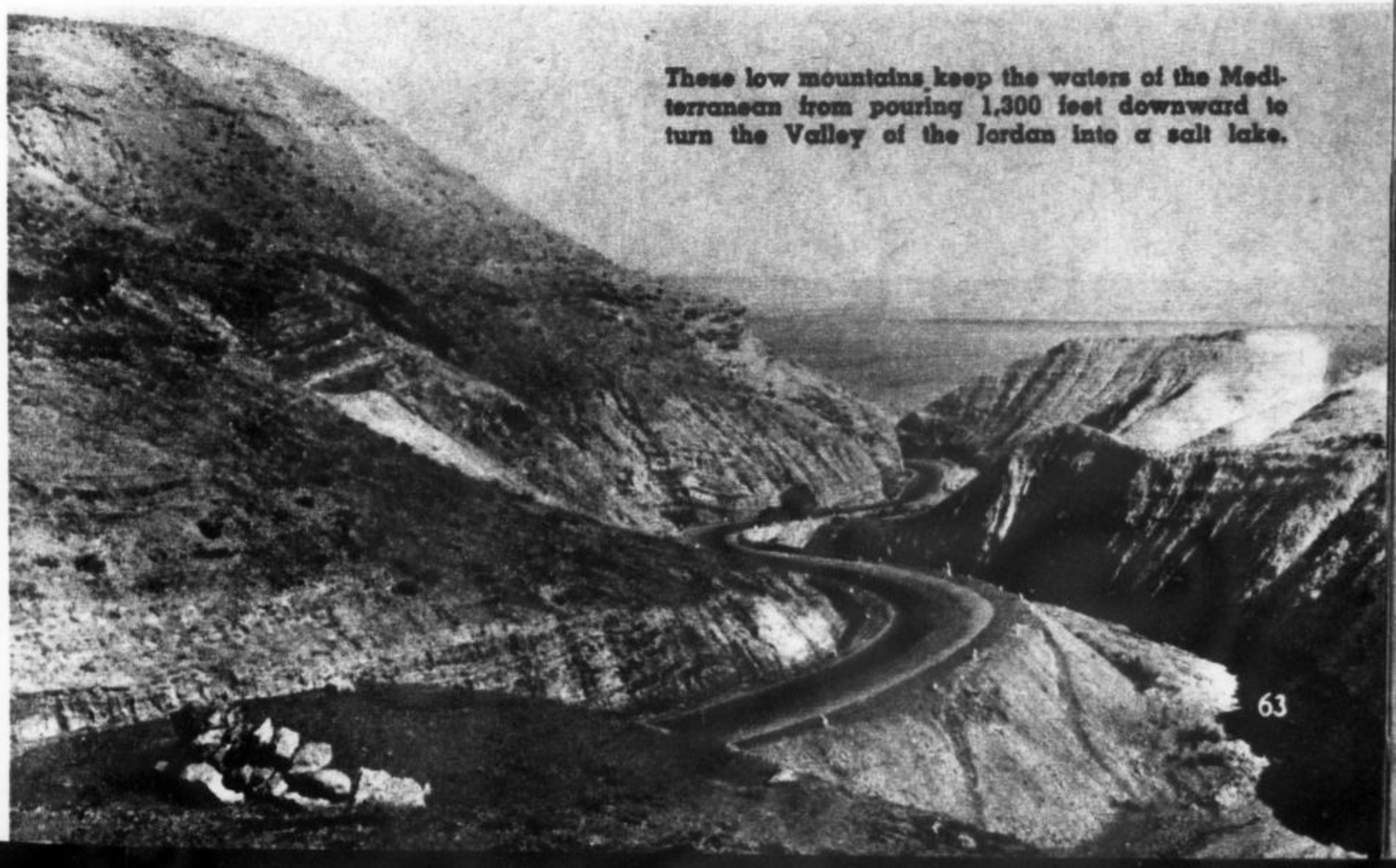
the problem of watering the arid land.

By making the waterway a succession of open canals and short tunnels, the highest point would rise only 300 feet above the Mediterranean. Naturally it takes power to lift a big volume of water 300 feet above sea level. But there is a 1,000-foot drop from the crest of these low mountains to the upper Jordan Valley. That difference in elevation could be used to generate enough electricity to power the pumping station and light some of the towns in the area.

From the power plant a navigable concrete canal could lead the overflow south on the Transjordan side of the river down to the northern edge of the Dead Sea. The canal could stay at almost the same level throughout its length so that it would still be about 600 feet above the Dead Sea and thus would have more than enough head to operate another power plant.

By tapping the Mediterranean to fill the Dead Sea, the Jordan could be dammed below Lake Tiberias, and the river's entire flow of fresh water used for irrigating the dry land. In this way more than 600,000 acres of unused land could be reclaimed.

Not only would the waterway from the Mediterranean replace the Jordan's flow into the Dead Sea but also the proposed canal could actually enlarge the surface area of the sea. Since much of the land bordering the Dead Sea is desert, the enlargement would not lessen the total of tillable land but would increase the present evaporation rate of 3,600 cubic feet per second. This additional moisture in the air, plus more water vapor from the surface of [*Continued on page* 165]



These low mountains keep the waters of the Mediterranean from pouring 1,300 feet downward to turn the Valley of the Jordan into a salt lake.

Flying-Wing Helicopter

Wing-tip propellers drive it through the air or rotate upward to enable it to hover and descend vertically.

BY FRANK TINSLEY

THE drone of powerful jet engines overhead draws the weather-beaten face of an old farmer upward from his hay mowing. A huge all-wing airliner soars low across the mountain valley, a tongue of flame belching from a storage compartment.

Ahead of the burning wing looms a

AIRBORNE INVASION, depicted here by the author, shows flying-wing helicopters being used to set up a base in rugged terrain. Jets' down blast helps cushion the 400-man transport's descent on "life-raft" landing gear.

towering peak of jagged rock. The old farmer braces himself for the crash and the blinding explosion that will wipe out the plane and all its occupants.

Then he sees a miracle. The mammoth silver wing comes to a full stop in mid-air, only 200 yards short of destruction.

The great propellers at its outermost tips swing in an upward arc on movable hubs. The crippled aircraft suddenly becomes a massive helicopter that hovers momentarily, then sinks slowly. Gently it floats down and comes to rest near the base of the mountain.

As the aircraft lands, deplaning ramps are let down and scores of passengers, armed with manual fire extinguishers, pour out to fight the flames. Quickly the fire fighters check the blaze. In a moment a fading puff above the huge wing is the only sign left of the near-tragedy.

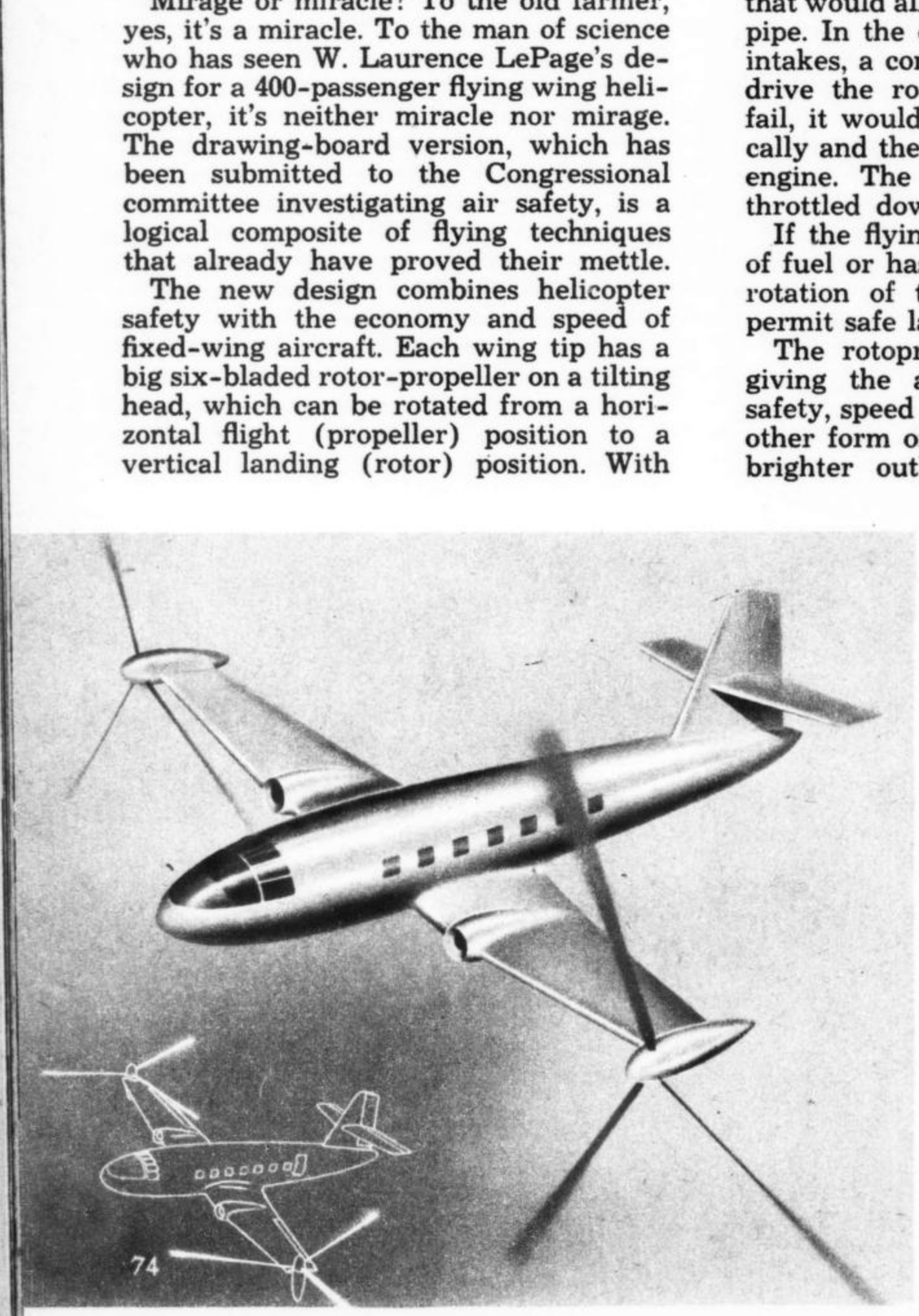
Mirage or miracle? To the old farmer, yes, it's a miracle. To the man of science who has seen W. Laurence LePage's design for a 400-passenger flying wing helicopter, it's neither miracle nor mirage. The drawing-board version, which has been submitted to the Congressional committee investigating air safety, is a logical composite of flying techniques that already have proved their mettle.

The new design combines helicopter safety with the economy and speed of fixed-wing aircraft. Each wing tip has a big six-bladed rotor-propeller on a tilting head, which can be rotated from a horizontal flight (propeller) position to a vertical landing (rotor) position. With the blades in rotor attitude, the plane would take off or land as a helicopter. Once aloft, the tilting head will swing forward and down till the blades are set in the conventional propeller position for level flight.

Since the jet engine, with its light weight and lack of vibration, would be the ideal powerplant for a "rotoprop" airliner, LePage's design calls for propjets set side by side in the wing tip at an angle that would allow the use of a common tail pipe. In the open "V" between their air intakes, a common reduction gear would drive the rotoprop. Should one engine fail, it would be disconnected automatically and the "prop" driven by the other engine. The other rotoprop would be throttled down and synchronized.

If the flying-wing helicopter runs out of fuel or has total engine failure, autorotation of the rotoprops alone would permit safe landing almost anywhere.

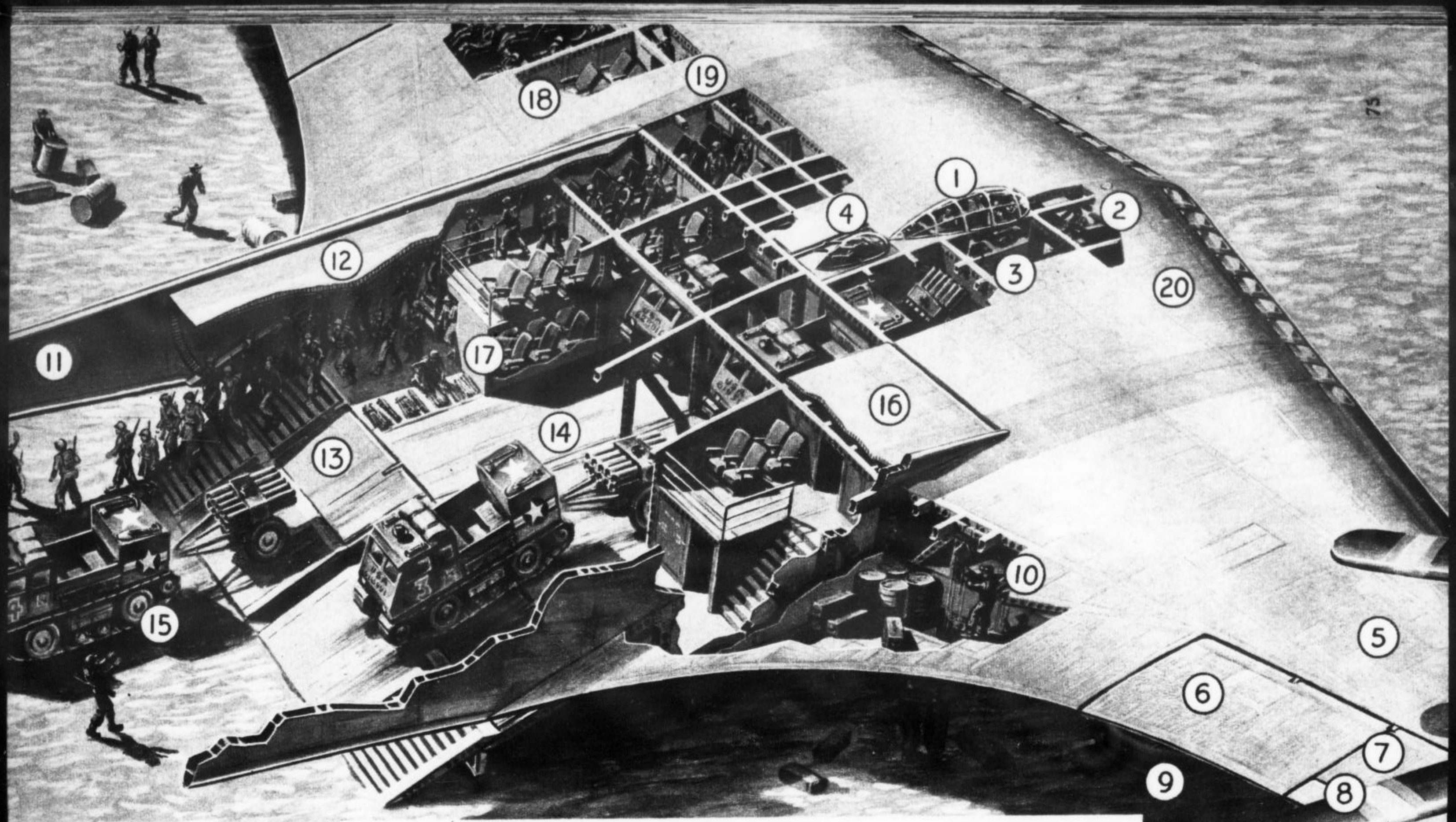
The rotoprop airliner, in addition to giving the air traveler of the future safety, speed and comfort far beyond any other form of transportation, promises a brighter outlook for airport operators as well. With takeoff and landing runs eliminated, the entire area of existing airports will be available for operations soon after production lines begin turning out LePage's winged giants, and low-cost airfields may be planned right on any large vacant lot. Such ready access to safe air transport could usher in an era that would change our civilization as profoundly as did the development of the automobile at the turn of the century. •



ON ENEMY SOIL, troops and rocket-launching personnel carriers stream down the ramps of the "rotoprop" transport and deploy for action. Cutaway reveals how the center section carried a battalion of troops with full equipment and supplies. Cargo hatches swing open under the wing, and crewmen hurry to unload ammunition, rations and fuel drums. Emptied, the transport guns its jets and shuttles off for a new load.

CONVERTIBLE HELICOPTER to cut hazards of air travel is proposed by Mr. LePage, who submitted this model to Congress group on air safety.

Mechanix Illustrated



1. Control Station
2. Navigator's Bridge
3. Crew Bunks
4. Remote-Control Guns
5. Fuel-Tank Section
6. Landing Flap
7. Aileron
8. 6-Blade Rotoprop
9. Landing Pontoon
10. Cargo Holds
11. Tail Boom
12. Opened Wing
13. Lowered Ramp
14. Center Hold
15. Personnel Carrier
16. Troop Quarters
17. Lower Quarters
18. Upper Quarters
19. Transverse Corridor
20. Officers' Quarters

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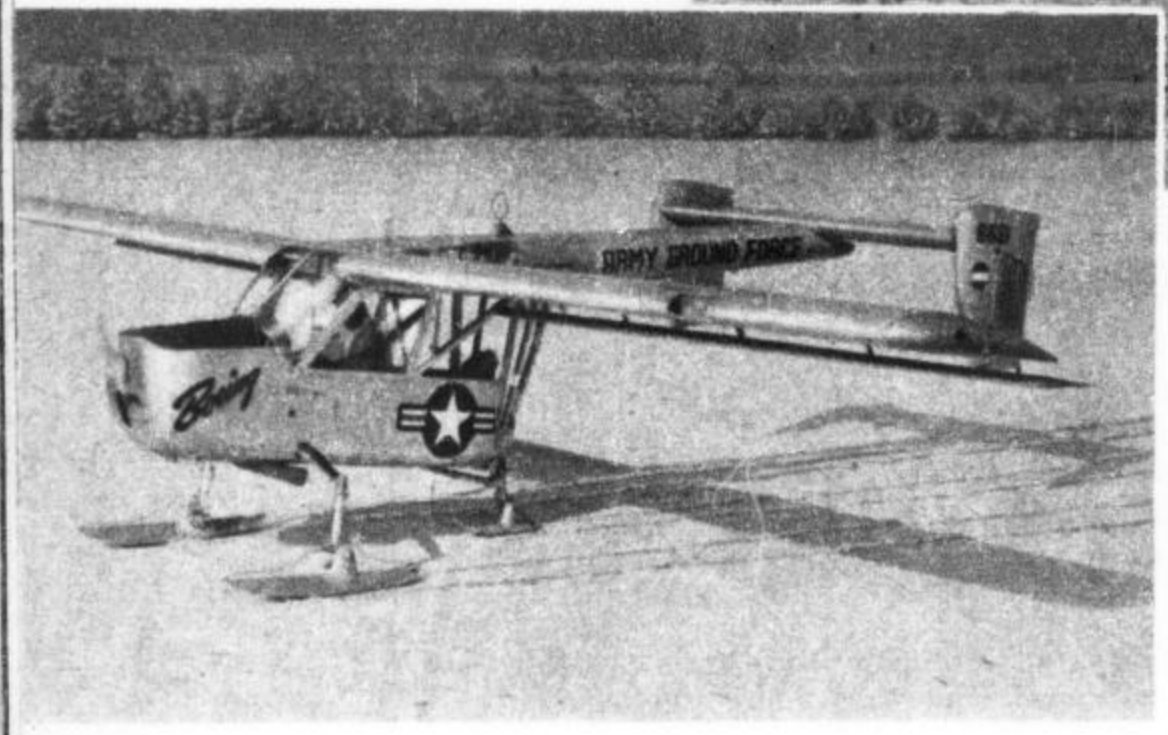
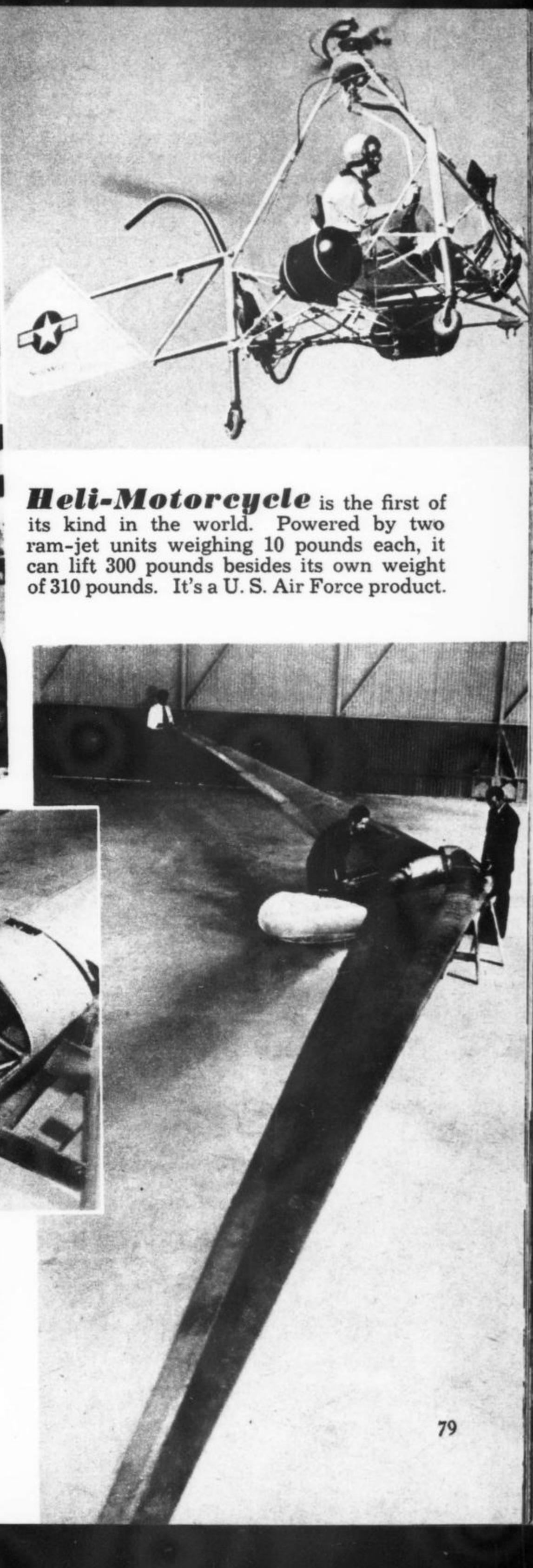


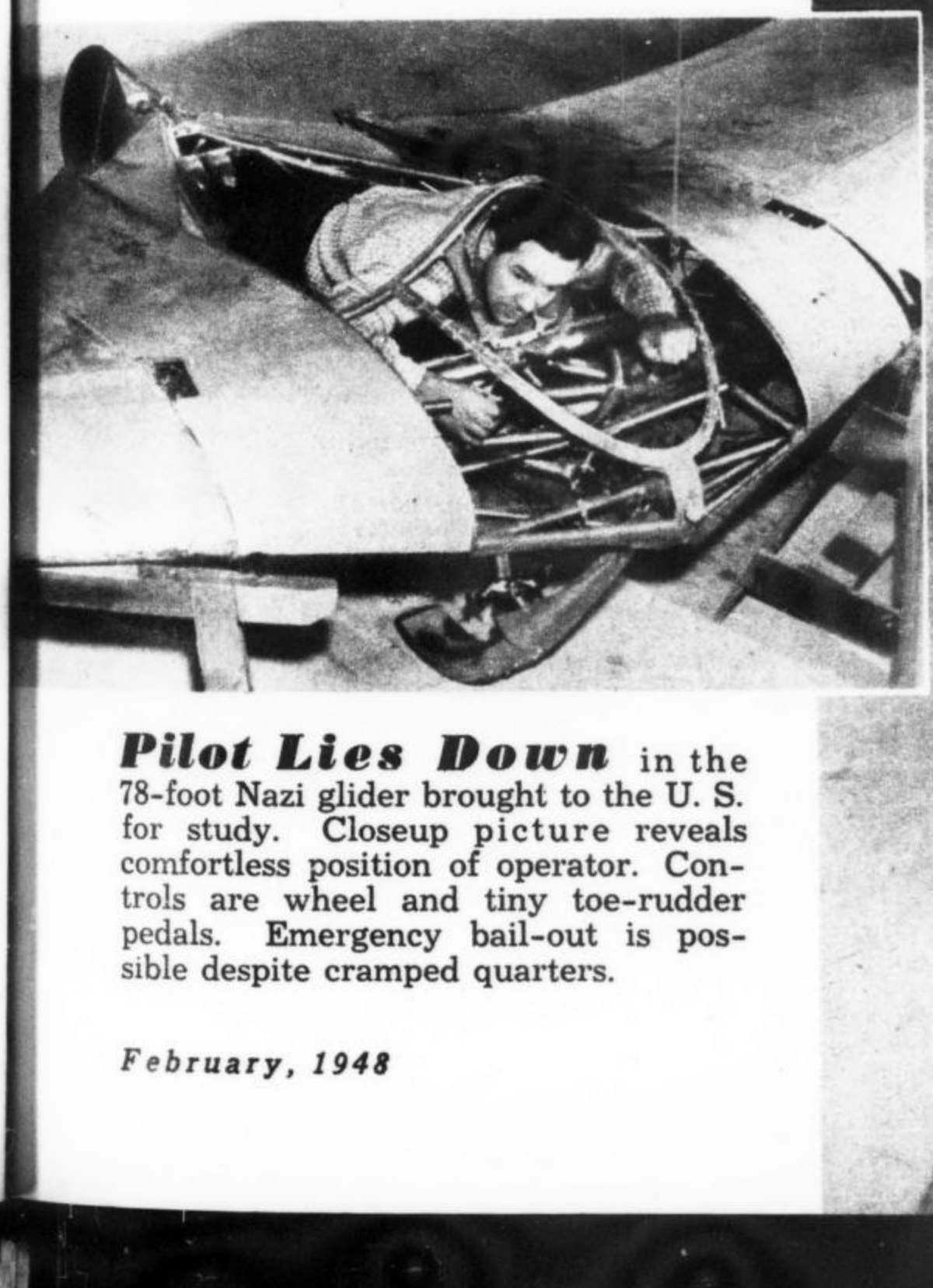
Collapsible Plane for the Army Ground Forces. Jeep can tow this package-unit Boeing XL-15 on its own wheels at 40 miles an hour; in the air it can hit 150 m.p.h.; on skis it is suited to winter aerial reconnaissance operations. Cabin has auxiliary heating system for operation at minus 65°. Reassembly for flight takes less than an hour.

Folding-Rotor helicopter has just been produced by the British for heavy pay-loads. It is a four-seater known as Type 171. It is intended for use as an air taxi, feeder-line bus, rescue work, or artillery spotting. Designed for life of 10,000 active hours.

Mechanix Illustrated



Heli-Motorcycle is the first of its kind in the world. Powered by two ram-jet units weighing 10 pounds each, it can lift 300 pounds besides its own weight of 310 pounds. It's a U. S. Air Force product.



Pilot Lies Down in the 78-foot Nazi glider brought to the U. S. for study. Closeup picture reveals comfortless position of operator. Controls are wheel and tiny toe-rudder pedals. Emergency bail-out is possible despite cramped quarters.

Undersea Base To Protect Subs From Atom Bombs

Rocket-carrying submarines would be Navy's best offensive weapon in atomic war, fighting from hidden supply depots in the ocean depths.

BY GILBERT PAUST

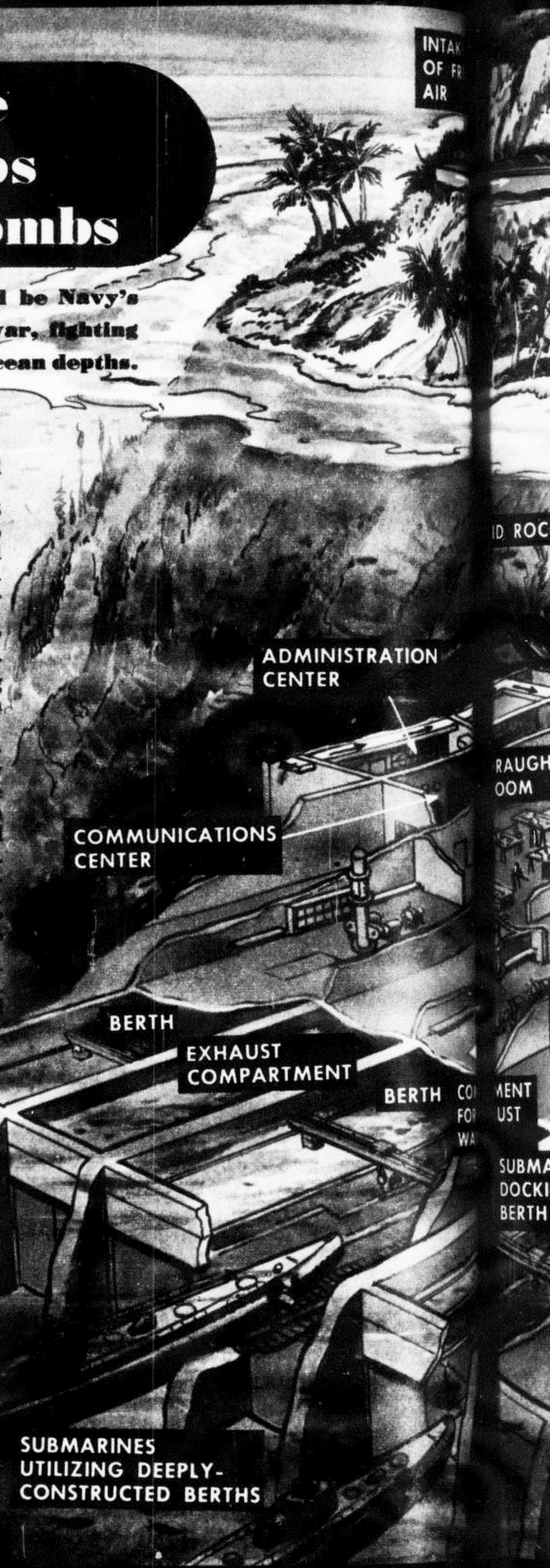
IN AN atomic war, the United States will have to "sink" its own Navy!

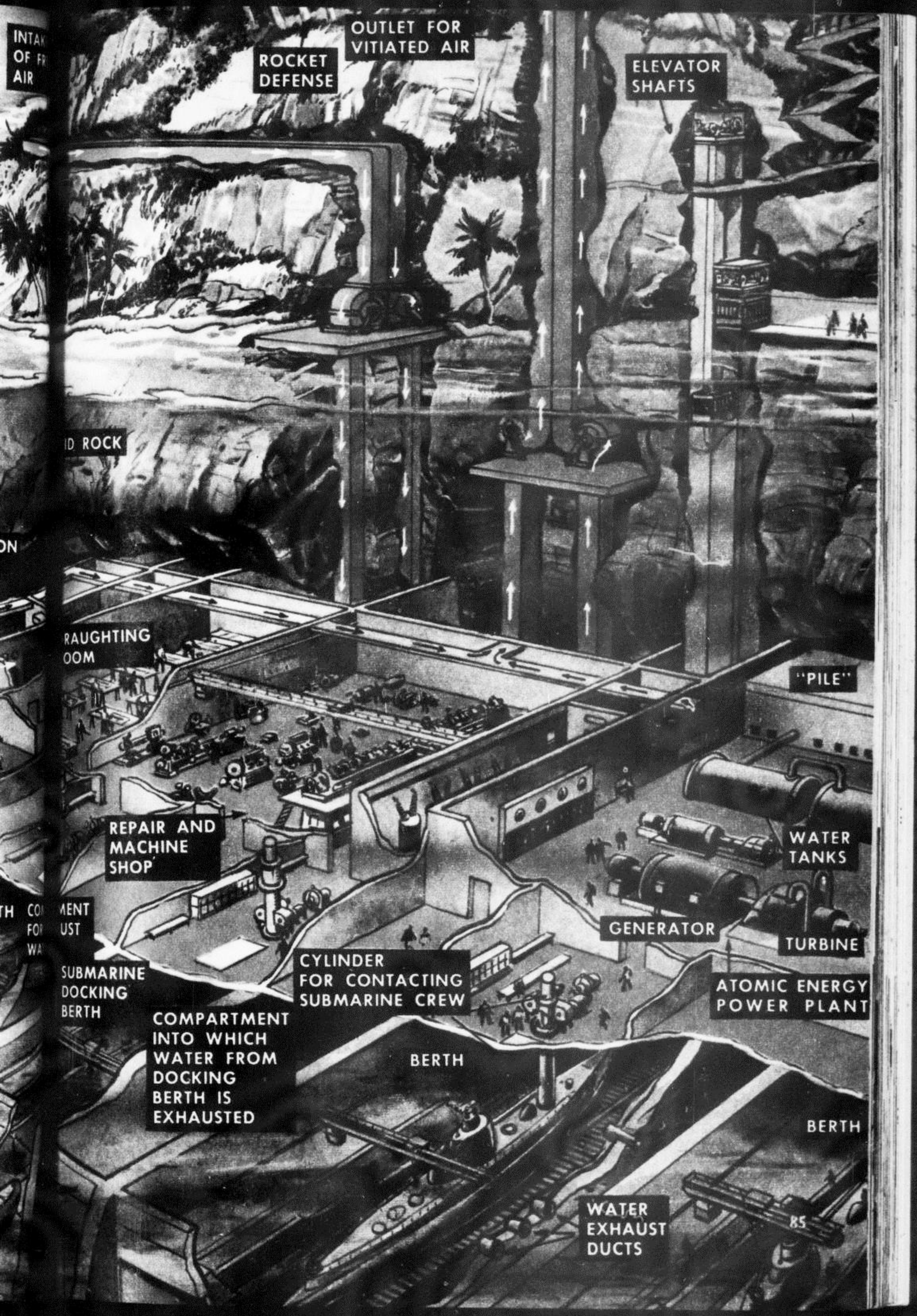
The Bikini atomic-bomb tests of 1946 proved that the ocean's surface will be no safer for warring vessels than ground level will be for inland military installations. An Atom Age Navy must go up or down—or out of existence!

Part of the Navy already has "gone up," with the development of a powerful air arm. But what of the "traditional" floating Navy, whose tactical value was erased with the advent of the atomic bomb?

The nearest thing to an official concession by the Navy that its once mighty surface arm will be useless in a future war came out of "Operation Agate," a series of all-Navy maneuvers conducted last fall in the waters near Oceanside, Calif.

The Armed Forces Press Service, reporting these maneuvers, pointed out significantly that "no battleships took part" in the mock assault on the "enemy-held" islands of San Clemente and San Nicholas. Only a few light cruisers were employed. Instead, rocket-powered projectiles, fired

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COMPARTMENT INTO WHICH WATER FROM DOCKING BERTH IS EXHAUSTED
BERTH
BERTH
WATER EXHAUST DUCTS
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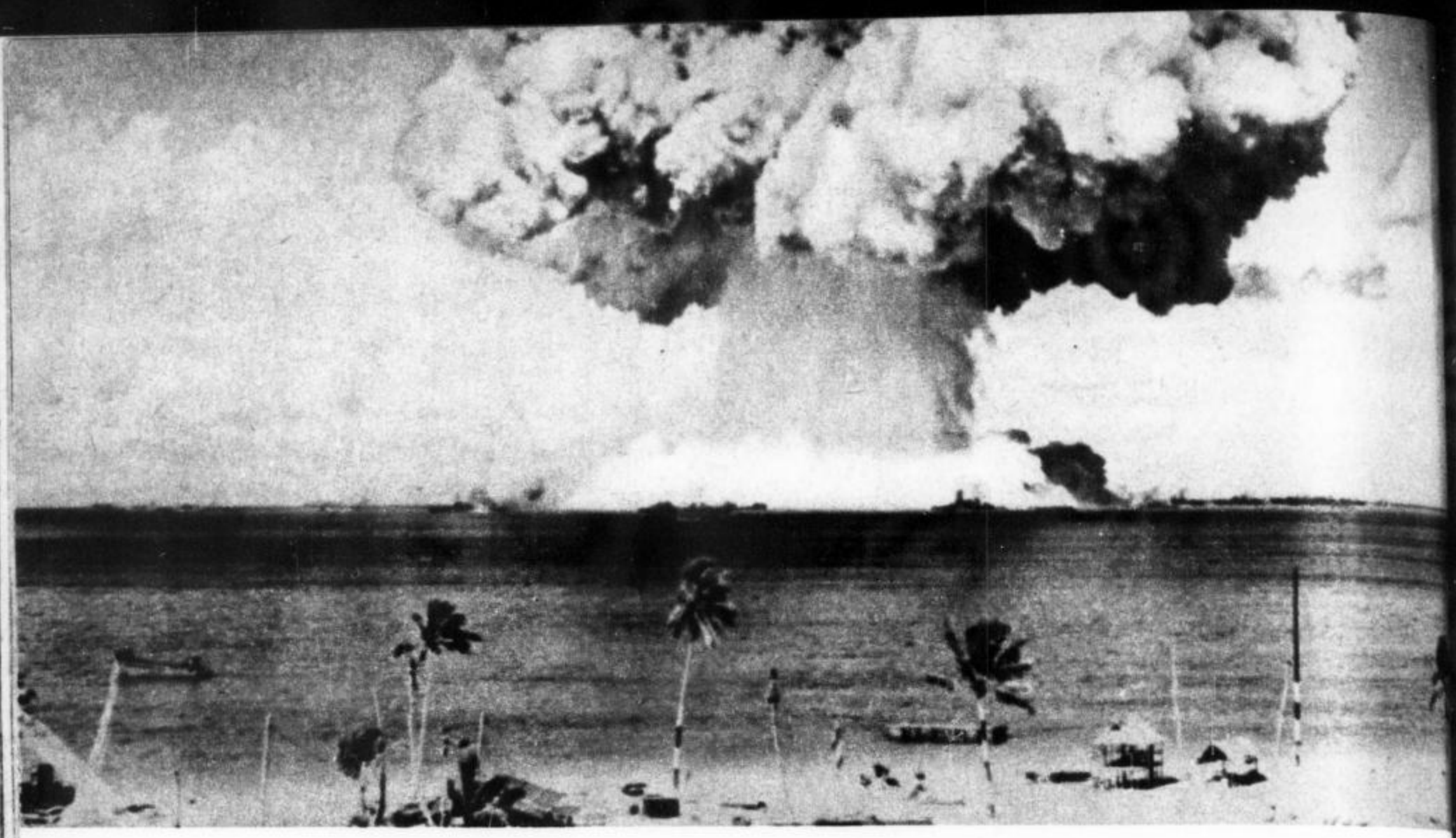


Atomic attack on an undersea base such as the author proposes for our Navy's subs might look like this underwater blast at Bikini—if the enemy did spot the target.

from Navy Skyraiders, rained on the little islands while swarms of submarines closed in to attack.

"The important part played by submarines in the exercises," the news service reports, "demonstrated the Navy's policy of making undersea craft a more powerful threat to enemy installations inland, as well as near coasts, by the use of equipment for launching guided missiles of supersonic speed, capable of carrying atomic bombs."

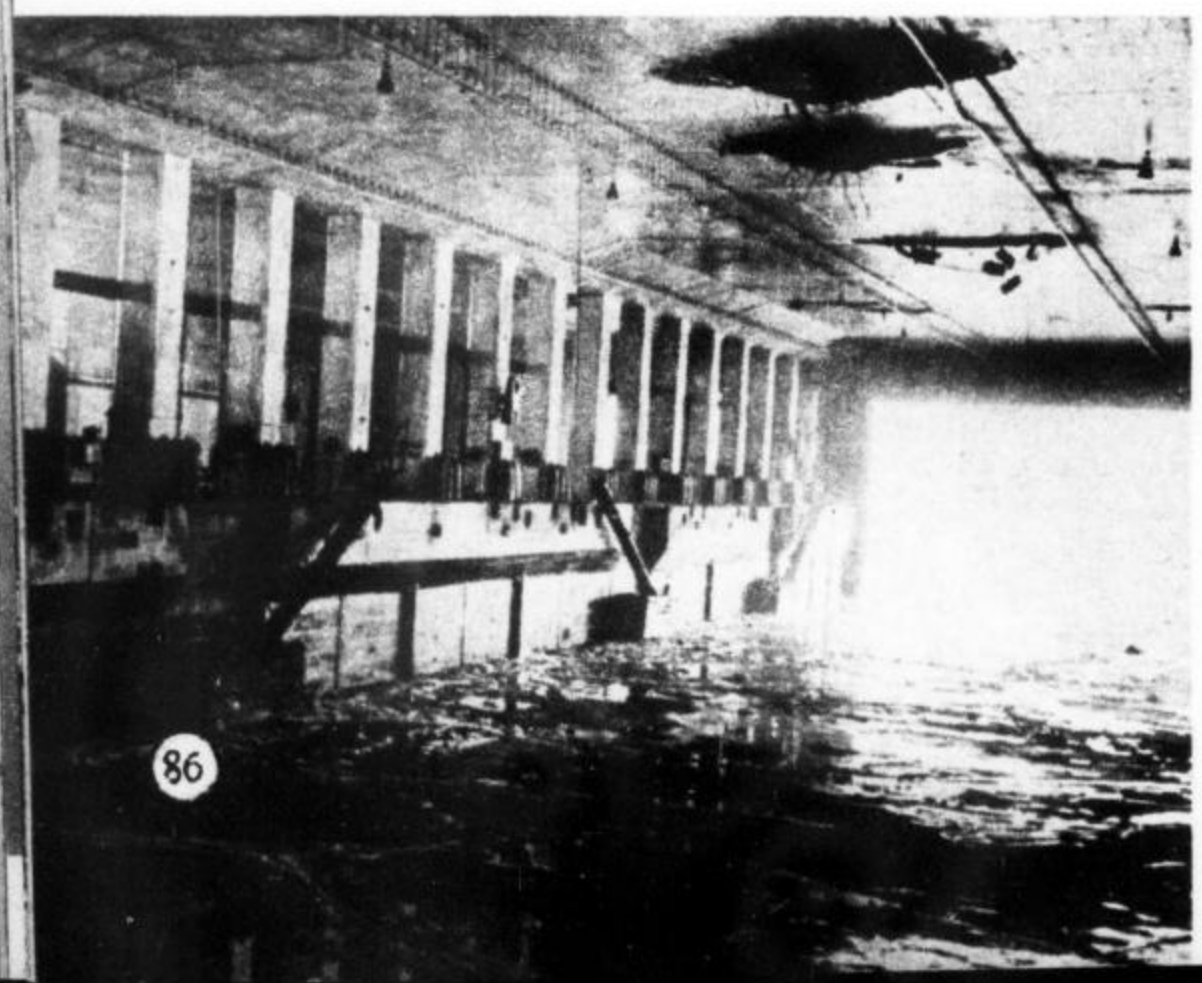
Thus, the "sinking" of its own Navy by the United States as a prelude to a third world war would involve not the mere scuttling of obsolete surface craft, but submerging its might to an undersea level, for a new kind of hide-and-seek, radar-proof warfare.

The submarine fleet of the future was born in the minds of Navy men at Bikini. As yet unborn, however, are the vast undersea bases from which such a fleet will have to operate to escape the Bikini-proved fatal consequences of surface operations exposed to A-bombing.

In an atomic war, concealment is the only way an A-1 priority military target can avoid destruction. Submarine bases below sea level will have an excellent chance of being unknown and remaining secret from the enemy.

The ability of an enemy to detect such bases will require devices and techniques that even World War II, which produced radar and the atomic bomb, failed to develop. Radar efficiency is minimized under water, and hydrophones, which can detect submarine sounds, will be equally impotent, since such bases will be insulated against them. An instrument to detect the heat, which the electric lights and galleys, welding torches and other power tools within the undersea base will produce and radiate, does not exist. Protection against visual detection, of course, will be a minor problem even with the camouflage techniques already known.

The biggest headache for the



Sub pen at Helgoland shielded Nazi U-boats from Royal Air Force bombs, but atom bomb could have destroyed it.

submarine engineer building the first undersea base for the Navy's tin-fish fleet of the future will be water pressure. Such bases cannot be planned for the floor of the ocean, or even in all the places which military experts will designate as strategic. Water pressure increases by one atmosphere—or about 14 pounds per square inch—for every 30 feet of depth.

Another limit will be imposed, not by what the structure can stand, but by what the submarines will be able to take. It would be senseless to design a structure for a depth of 2,000 feet, for example, if the submarines which are to use it can stand only the pressure of 1,000 feet.

The submarine bases of the future probably will be built under a few hundred feet of water. It would take a very strong structure to support even the weight of 300 feet—and the ideal location will be in an ocean current, in case somebody does invent an ultra-sensitive heat-detecting device that will work under water as well as in the air.

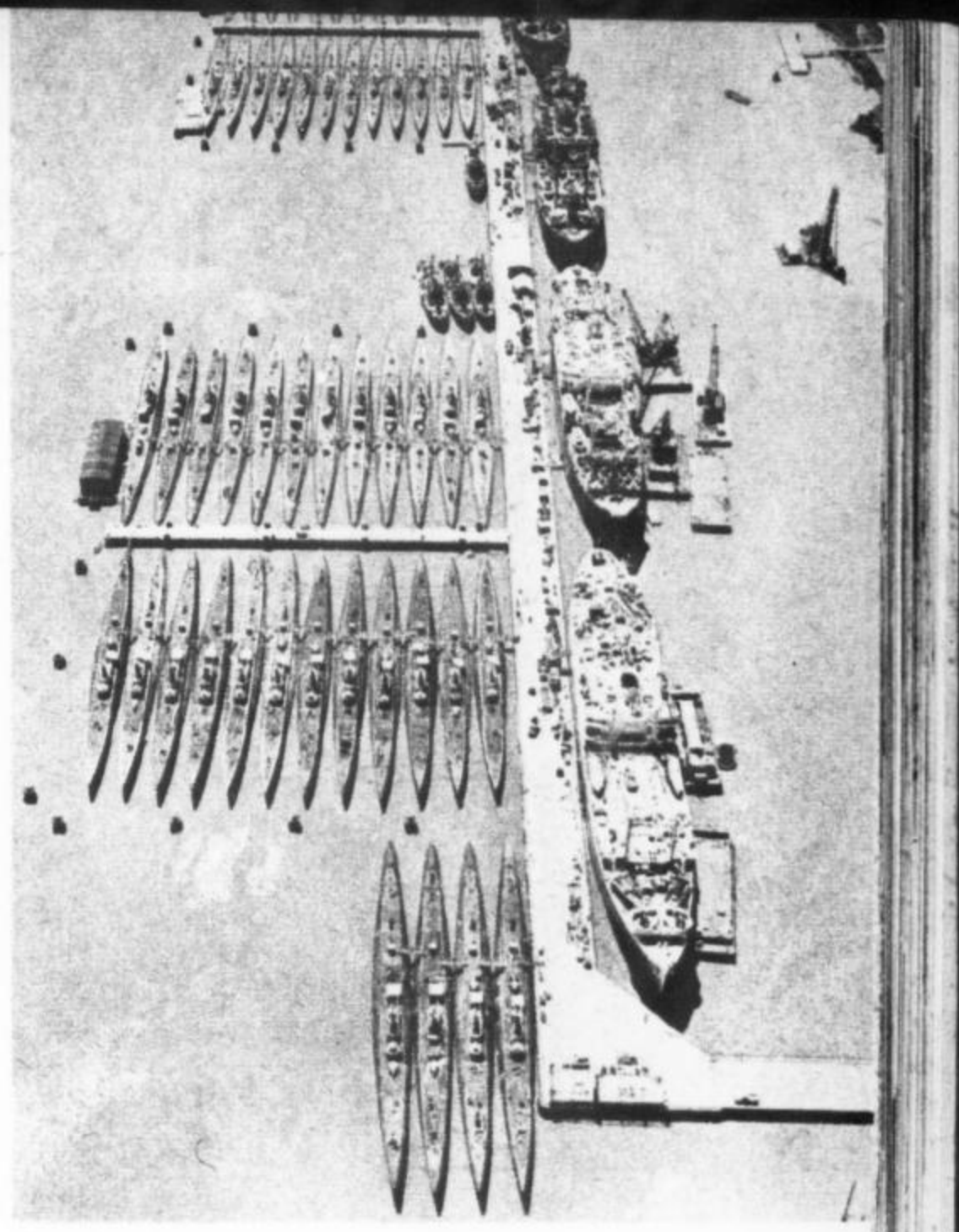
Ventilating a large undersea base, where major repairs could be made and from which a score or more of super-submarines could be supplied with food, ammunition and general maintenance, is difficult but not impractical.

A system of horizontal and vertical shafts, driven from the base through ground rock and up to carefully camouflaged surface hatches, will be supplemented by liquefied oxygen and chemicals capable of absorbing the carbon dioxide and moisture from the air within the base. Even soilless gardens may supply the base with fresh vegetables and, at the same time, assist in absorption, since plants use both the moisture and carbon dioxide.

The berths for the submarines probably will be caves on the underside of the base, filled to the top with water rather than partly filled with air, which would cause huge bubbles to rise to the surface when a submarine entered. A water-filled steel cylinder, descending from a room above the pen, will secure itself to a hatch atop the entering submarine so that only water in the cylinder will have to be pumped out to provide a dry shaft between the submarine and the base.

The utilization of such bases for submarine V-2 missile ships, troop carriers, scouts and other tactical variants, is still in the future. Yet, the Navy's present-day realization, based on Bikini and other tests, that recognition of a target means its annihilation sets the stage for their development as one of America's hopes for survival in an atomic war. •

February, 1948



Bomb's-eye view of these subs clustered at Mare Island, Calif., shows how an atom blast could wipe out a typical "sitting duck" naval base.

What a surface atom-bomb explosion can do to a sub is indicated by this closeup of the battered U. S. S. Skate after the Bikini tryout.

MECHANIX ILLUSTRATED

FEBRUARY

MORE PAGES ONLY 20c

PILOT'S STRATOSPHERE SUIT

I FULL COLOR—PAINTINGS THAT REVEAL INSANITY

BUILD A RANCH-STYLE HOME FROM MUD SEE PAGE 114

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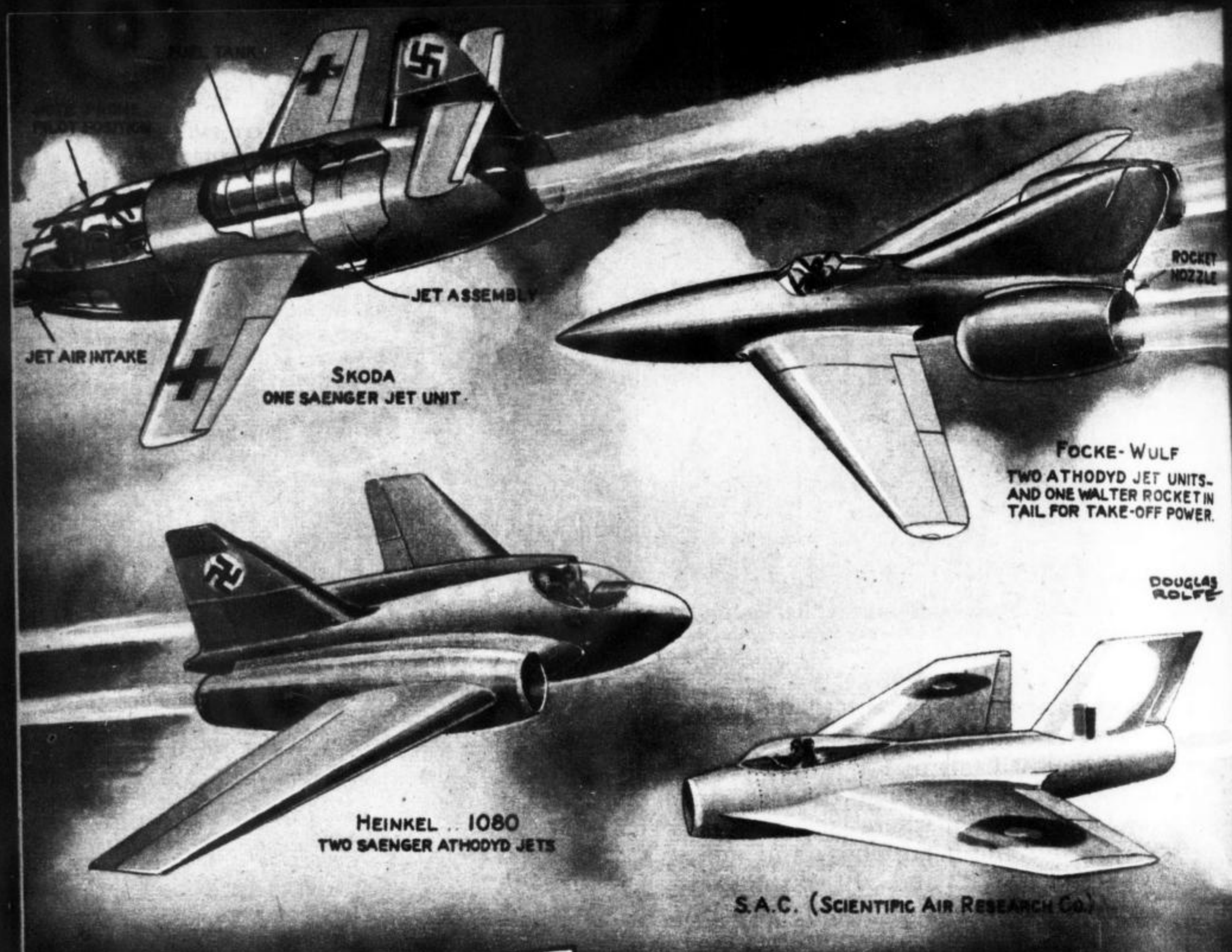
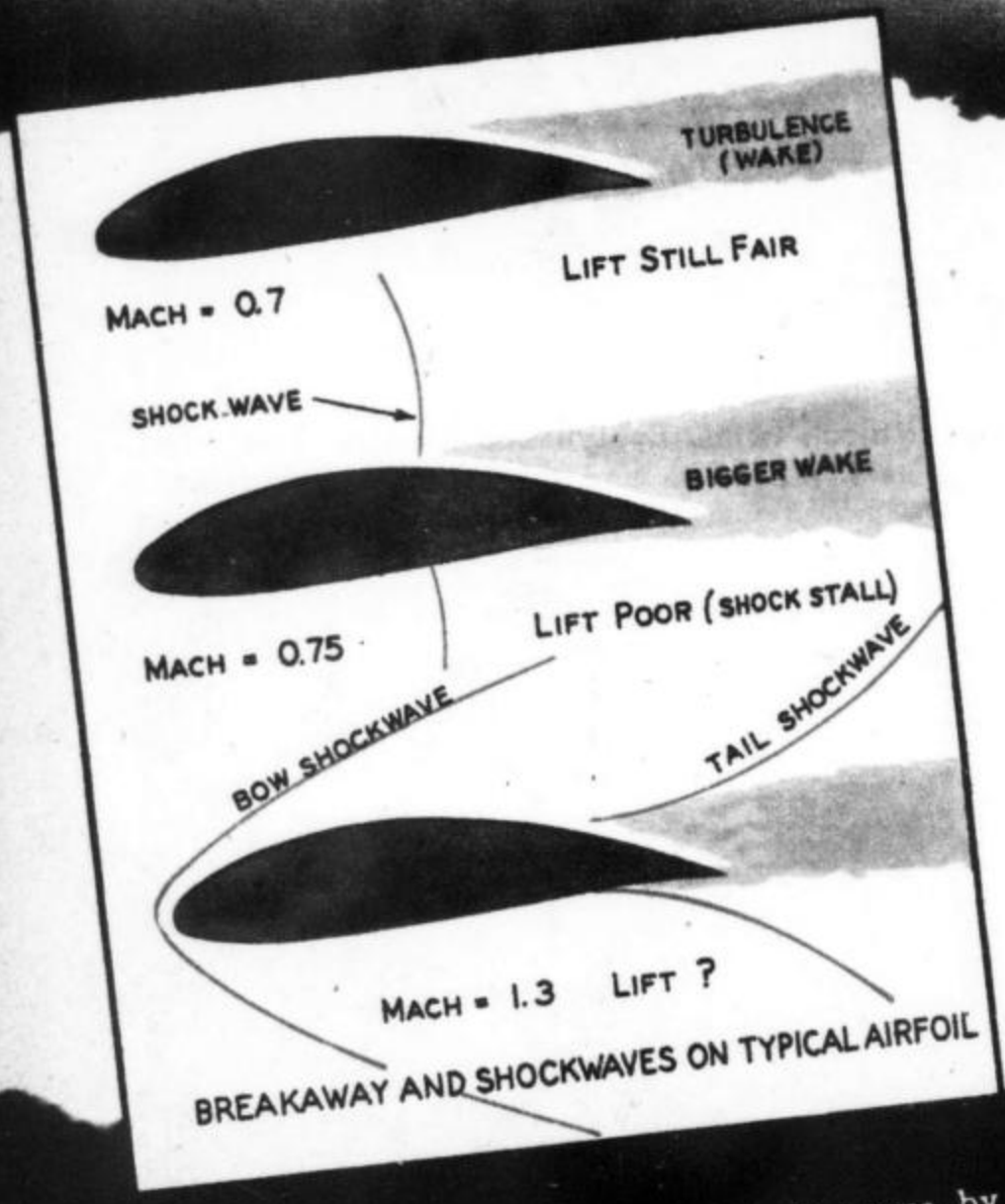
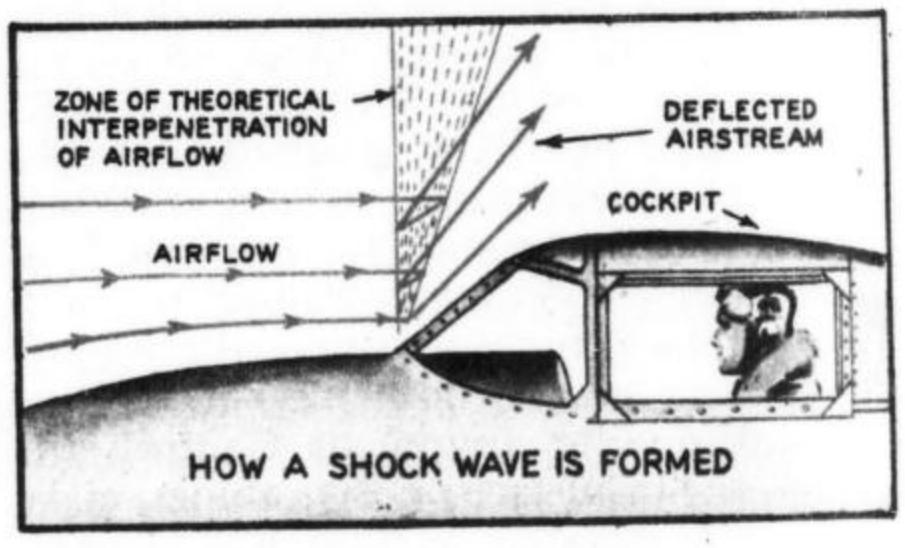
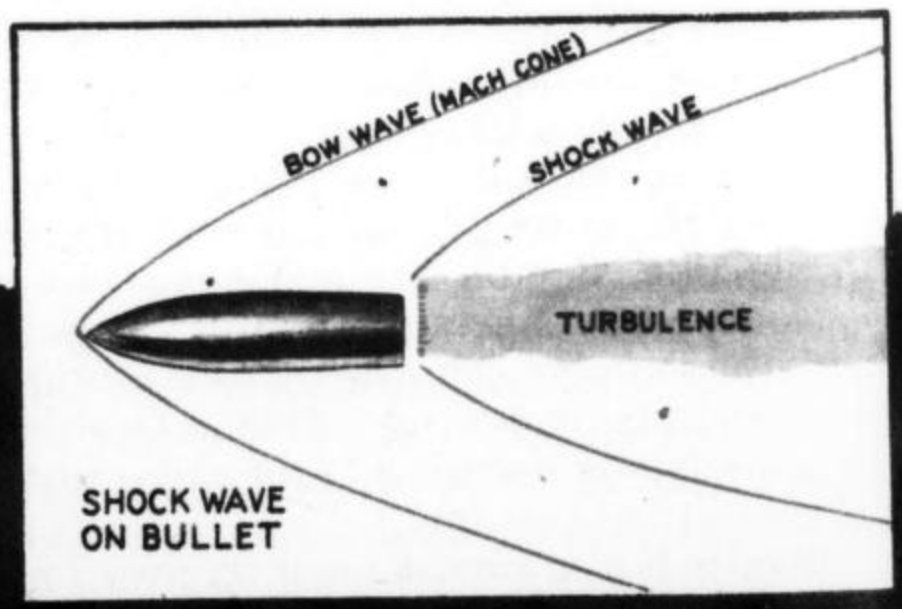








Above right, the formation of a shock wave by the protruding cockpit. Above, an airfoil showing the form of the shock waves at three speeds. Right, shock wave formed by a speeding bullet.

this is the Supersonic barrier

Extraordinary things happen close to the speed of sound.

BY
WILLY LEY

Bottom view of the de Havilland "Swallow," showing its arrow-like sweepback.

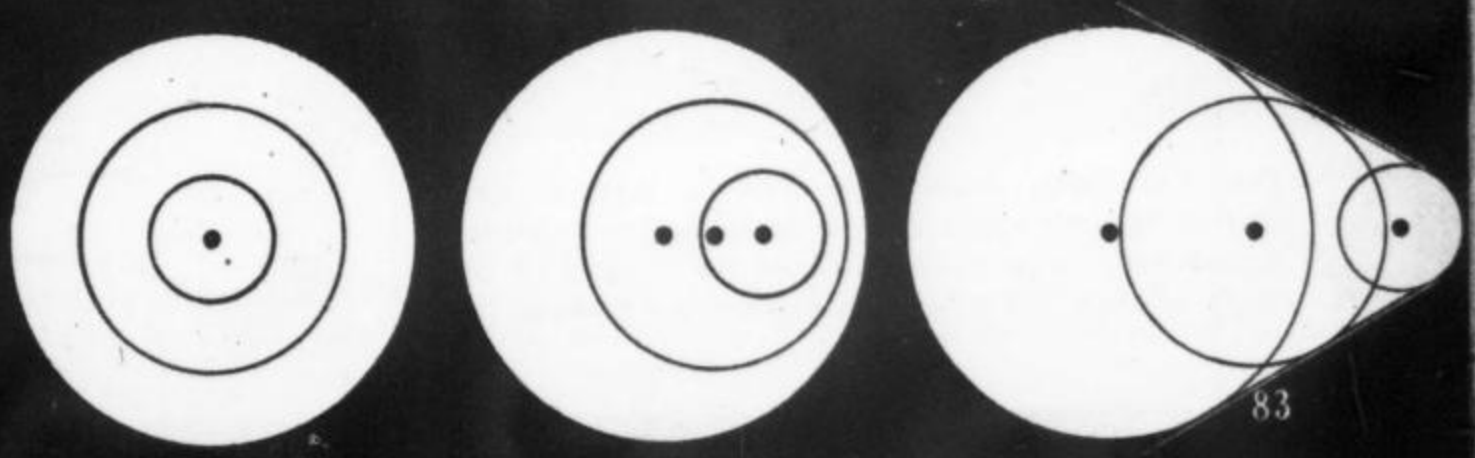
FOR millenia man dreamed about flying—and did nothing about it. In 1783 the balloon was invented and people could fly wherever the wind happened to blow them. More than a century later the airplane was invented—and people began to be able to fly where they wanted to go.

Now, forty-four years later, man wants to fly faster than sound. He will do it. Aeronautical science is close to this goal; it may take only a year or two. But there are difficulties, and most of them are tied up with something which is called a Mach number. (The term honors the Austrian physicist Dr. E. Mach, who was one of the first to investigate the problems of air resistance at high speeds.)

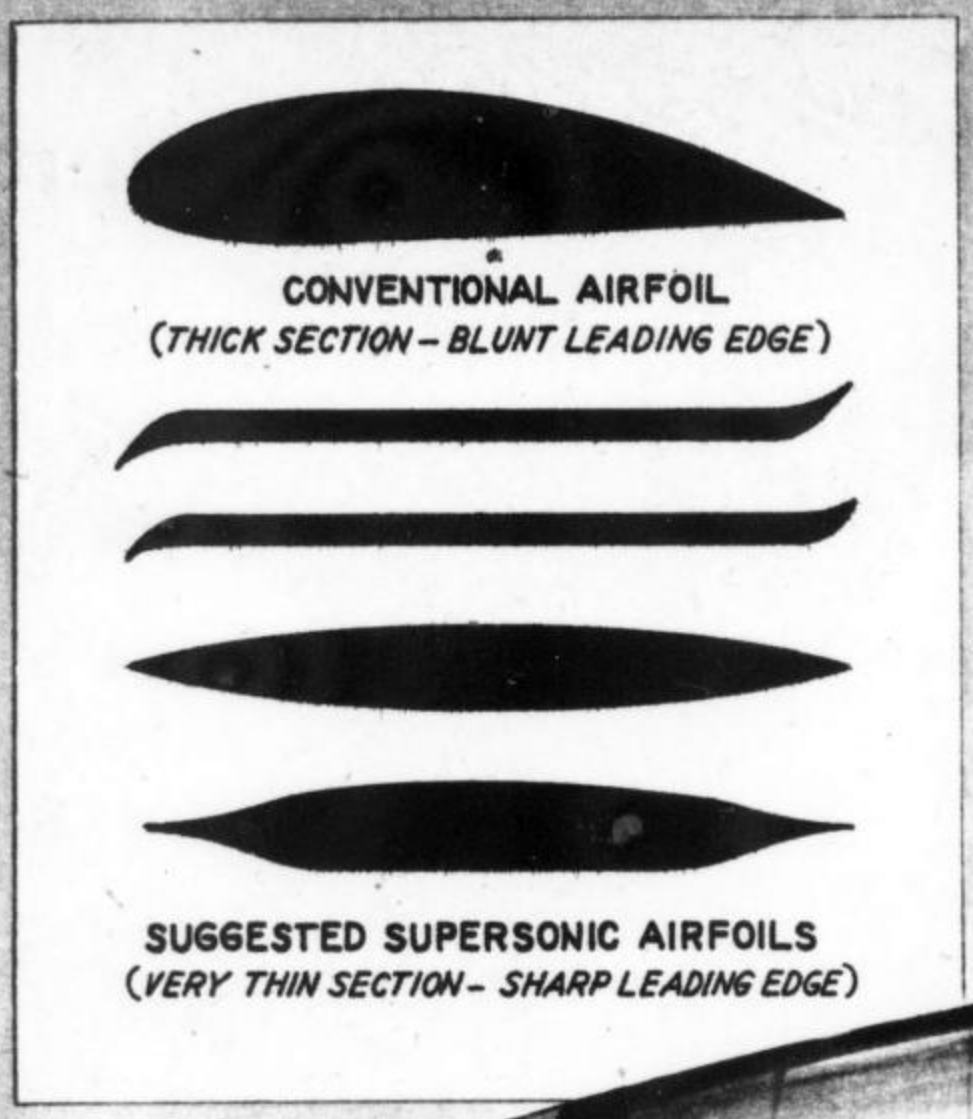
The Mach number is a convenient means for expressing an important ratio in one word: it's the relationship between the speed of something—car, airplane, rocket or bullet—and the velocity of sound at the same altitude. Note: at the same altitude. This is important, since the velocity of sound is 765 mph at sea level but 100 mph less at 40,000 feet. To say that a plane flies with Mach number 0.5 means that it has just half the velocity of sound at the altitude where it happens to be.

Because the velocity of sound decreases as we go up in the air, a plane might have Mach number 0.5 at or near sea level, but Mach number 0.7 at high altitudes. And that is where the difficulties start. When its Mach number approaches 0.7 the air begins to behave differently. Instead of smoothly flowing around the wing it tries to pile up, and at corners and surface irregularities the air gets into its own way, so to speak, and builds into a shock wave; and when the speed (and of course the Mach number) grows large enough there are additional shock waves where the airflow begins to separate from the wings. All this makes for big trouble at trans-sonic speeds.

At this point we'd better define a few terms. At Mach numbers of 0.65 or less (about 500 mph or less) airplanes are said to fly at *subsonic* speeds. At Mach numbers of 1.3 or higher (say, 1,000 mph and up) they are said to fly at *supersonic* speeds. The interval between the two is called *trans-sonic,* and that is the region now under attack. The fastest planes are already in the lower reaches of that range. The Mustang [*Continued on page* 96]



Diagrams show: left, a disturbance center that is motionless, relative to air; middle, a disturbance center moving; and right, a disturbance center moving fast.



FAIRING CONE OF RAM JET RETRACTED

LANDING ROTORS RETRACTED INTO OUTER SKIN OF CABIN

ROTOR HEAD FAIRING DOORS

PRESSURIZED DOUBLE-DECK CABIN

SUPERSONIC SECTION AIRFOIL WING

ROTOR UNITS EXTENDED FOR SLOW, CONTROLLED LANDING APPROACH

ATHODYD JET POWER CUT OFF

NC-410Z

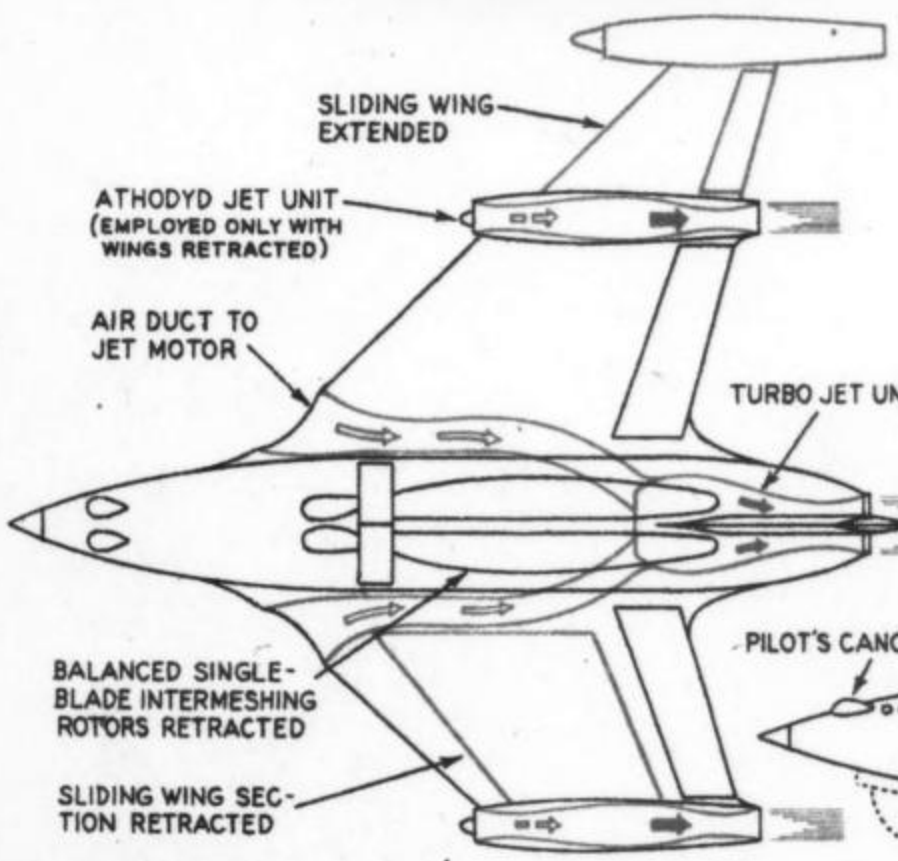
ELEVONS IN "DRAG" POSITION

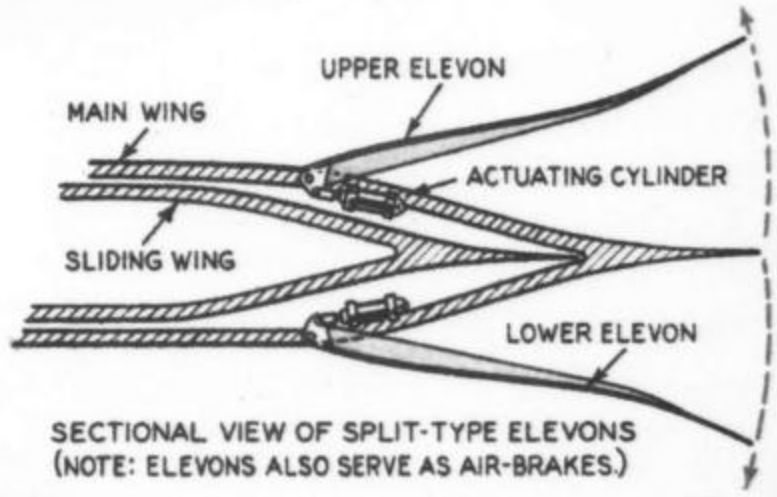
Douglas Rolfe, nationally known aircraft artist, draws the probable shape and shape changes of tomorrow's supersonic airliner as it flies at ordinary speeds (right) and at supersonic speeds (top).

SLIDING WING SECTIONS RETRACTED
AND RAM-JET POWER TURNED ON

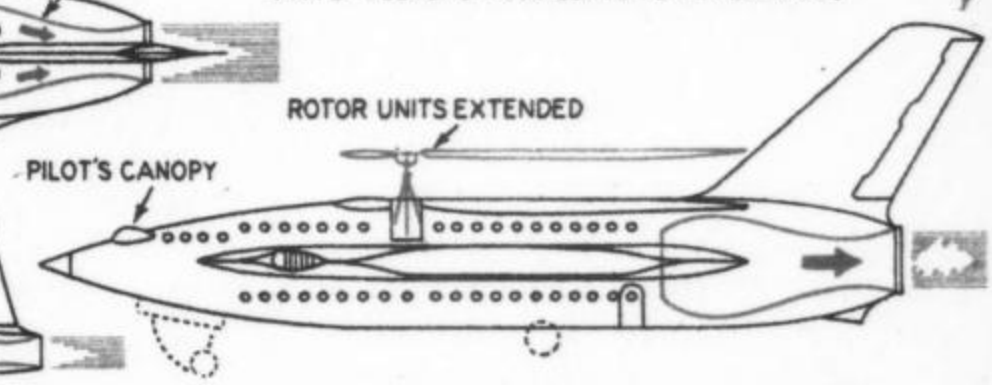
TURBO-JET
EXHAUST NOZZLE

DOUGLAS
ROLFE





SECTIONAL VIEW OF SPLIT-TYPE ELEVONS
(NOTE: ELEVONS ALSO SERVE AS AIR-BRAKES.)



Note in diagrams and drawings that at lower speeds the wing panels are extended, and the helicopter rotors and turbo-jet unit employed.

At supersonic speeds the wing panels are retracted, the rotors fit snugly inside the fuselage, and the athodyds or ram-jets take over.

MECHANIX ILLUSTRATED©

15c

MAY

Build this 40-MPH Model Speedboat. See page 118

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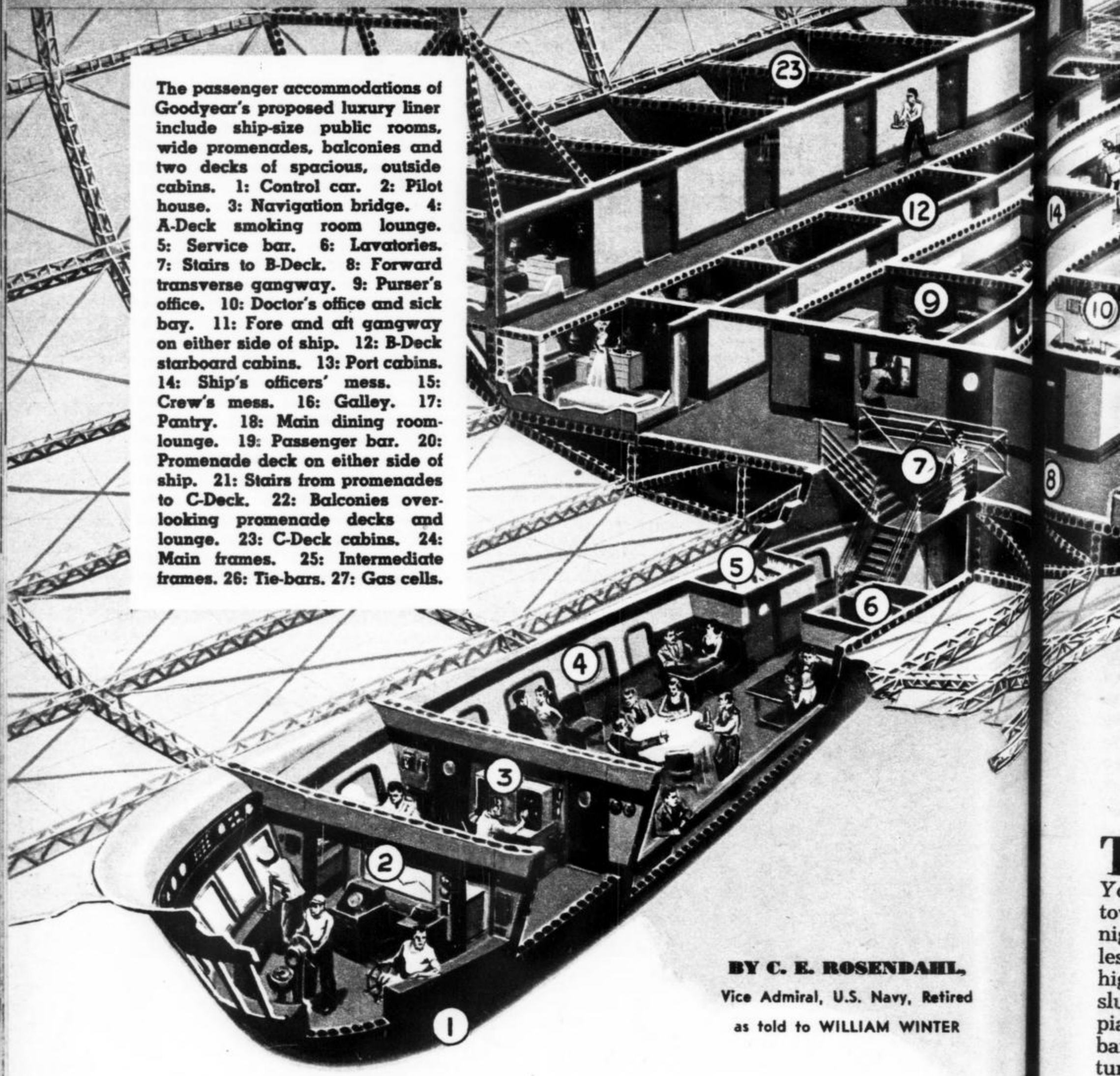
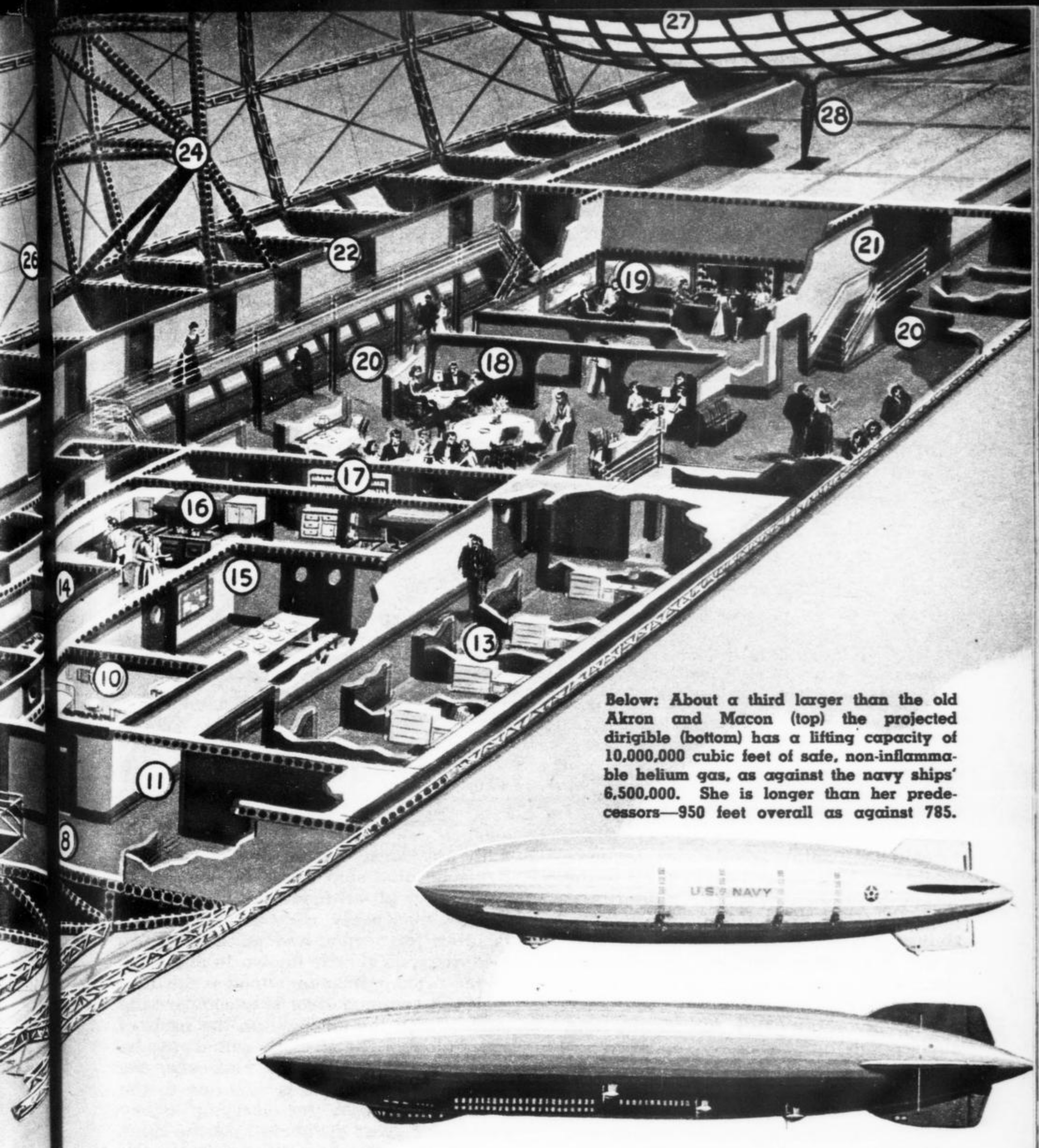
NEW SUPER DIRIGIBLE DESIGNED FOR WORLD TRAVEL

The world's outstanding authority on lighter-than-air craft gives you an exclusive behind-the-scenes look at Goodyear's plans to bring the safest, least expensive and most comfortable long-distance air transportation back into the skies.



The passenger accommodations of Goodyear's proposed luxury liner include ship-size public rooms, wide promenades, balconies and two decks of spacious, outside cabins. 1: Control car. 2: Pilot house. 3: Navigation bridge. 4: A-Deck smoking room lounge. 5: Service bar. 6: Lavatories. 7: Stairs to B-Deck. 8: Forward transverse gangway. 9: Purser's office. 10: Doctor's office and sick bay. 11: Fore and aft gangway on either side of ship. 12: B-Deck starboard cabins. 13: Port cabins. 14: Ship's officers' mess. 15: Crew's mess. 16: Galley. 17: Pantry. 18: Main dining room-lounge. 19: Passenger bar. 20: Promenade deck on either side of ship. 21: Stairs from promenades to C-Deck. 22: Balconies overlooking promenade decks and lounge. 23: C-Deck cabins. 24: Main frames. 25: Intermediate frames. 26: Tie-bars. 27: Gas cells.

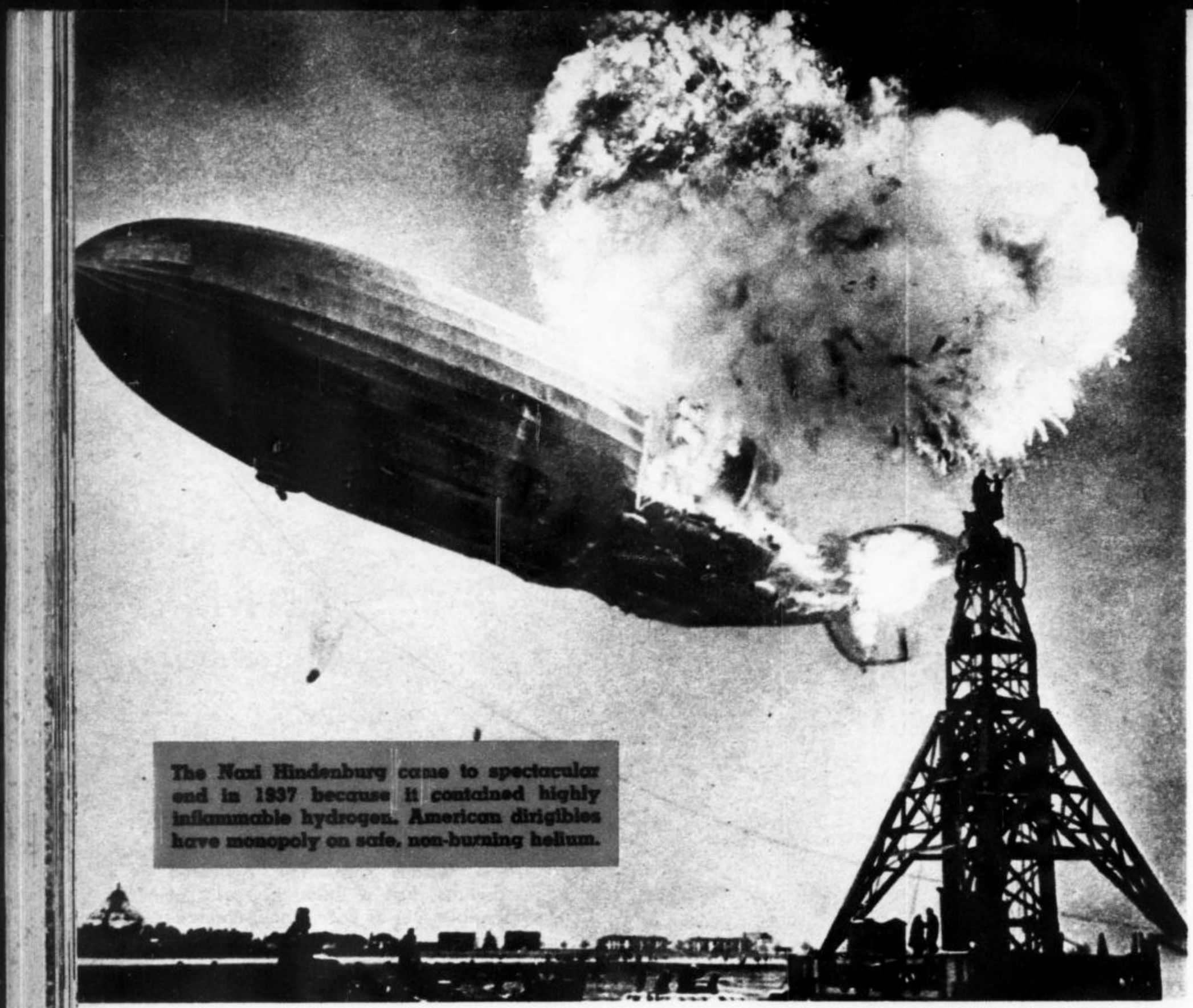
BY C. E. ROSENDAHL,
Vice Admiral, U.S. Navy, Retired
as told to WILLIAM WINTER



Below: About a third larger than the old Akron and Macon (top) the projected dirigible (bottom) has a lifting capacity of 10,000,000 cubic feet of safe, non-inflammable helium gas, as against the navy ships' 6,500,000. She is longer than her predecessors—950 feet overall as against 785.

TWO hours out of the port whose name she bore, the thousand-foot liner *New York* slid smoothly through the dark toward London, only a day and another night away. Lashed by the fall storm, less fortunate vessels wallowed through high seas. On the *New York,* passengers slumbered in spacious staterooms and a piano tinkled softly in the lounge. In the bar, a business man picked up his drink, turned to his companion and said, "Amazing, these dirigibles. Not even a ripple in a glass. I remember one crossing in 1949 —you recall how rough those surface crossings could get—when . . ."

Day dreaming? Well, not exactly. The Goodyear Rubber Company is interested in plans for a 10,000,000 cubic-foot dirigible, a monster that would have a 35% greater helium capacity than the old *Macon* or the *Akron.* Nine hundred and fifty feet long, 142 feet in diameter, with a cruising range of 7,000 miles on its six 1,050 horsepower engines, the new super-



The Nazi Hindenburg came to spectacular end in 1937 because it contained highly inflammable hydrogen. American dirigibles have monopoly on safe, non-burning helium.

airship has exciting possibilities commercially as a long-ranged supplement to the airplane and the steamship. Militarily, it suggests itself as a guided missile ship, flying aircraft carrier or hospital transport. If properly employed, the lighter-than-air ship would prove highly effective for scouting, patrol and observation, comparing favorably with submarines and surface flat-tops.

The giant passenger dirigible as visualized would offer three kinds of service to the traveler: a de luxe 112-passenger version with roomy, outside staterooms; a 232-passenger Pullman job; or a 288-passenger low-fare model with reclining chairs after the manner of the new all-coach trains. All three versions would have dining rooms and spacious corridors. In fast freight service, such a dirigible could transport 180,000 pounds of cargo from San Francisco to Honolulu, or 110,000 pounds from Honolulu to Shanghai.

Of particular interest to the military departments is the ability of the big dirigible to carry 248 wounded on the smoothest, quietest ride obtainable with any form of transportation. This flying hospital ship would be completely equipped with an operating room, well-stocked dispensary, mess and convenient facilities for doctors and nurses.

Perhaps no vehicle known to man is so under-rated or misunderstood as the dirigible. A common error is to compare the airship with the airplane on the basis of speed alone. The airplane will always be faster than the airship. However, the lighter-than-air craft is superior to the transport airplane for carrying heavy loads over great distances. At the same time, it is three or four times as fast as the ocean liner. In reality, there is a need for all three types of transportation. Any concept that the airship is not more economical, comfortable, or dependable than the heavy transport airplane lacks factual basis. The greatest misconception of all is to class the airship as a poor relation of the airplane. Like the steamer, the airship is a "displacement" vessel and constitutes a category of its own.

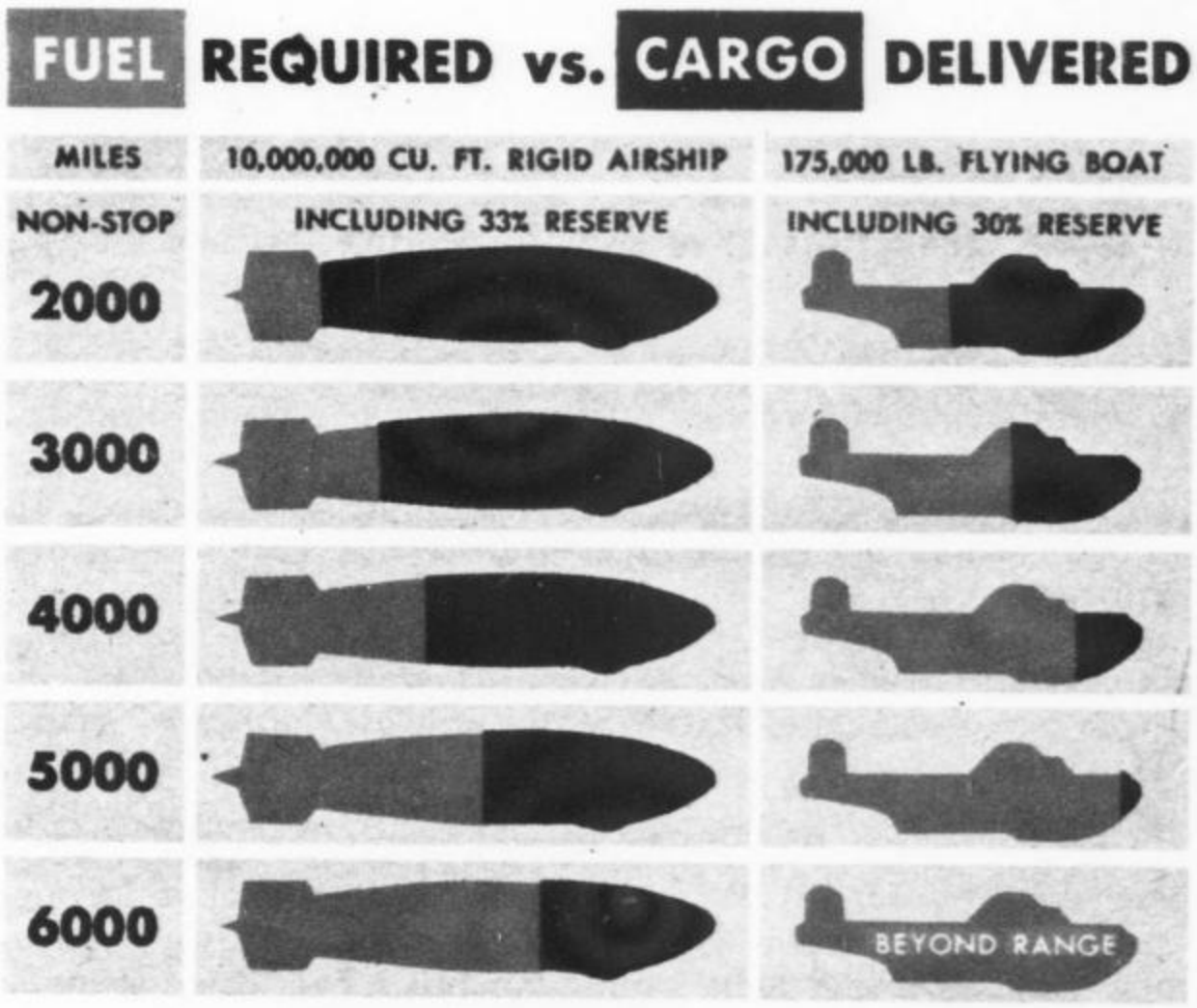
For the same sum of money, an operator would have the choice of four modern dirigibles or a fleet of some twenty large

flying boats of a gross weight each of 175,000 pounds. At the short range of 2,500 miles, where you could expect the airplane to be at an advantage, each fleet would be capable of carrying 3,000,000 pounds of cargo a week. However, the airship could do the job at about half the ton-mile cost of the flying boat. At 4,000 miles, the airship does the job for one-third the cost by airplane. At really long ranges, the airplane would have to carry nothing but fuel; unless refueling bases were available, it would be forced to concede defeat.

For sheer comfort and dependability you will have to go a long way to beat the dirigible. A glance at the illustrations accompanying this article shows why. Attractive accommodations are roomy and quiet, far quieter in fact, than Pullman travel. The old German Zeppelins that plied the Atlantic before the war provided such niceties as a smoking room, a 50x16-foot dining room, promenades, electric kitchen, writing room, bar, shower baths, and even a piano. They came and went under varied conditions, including zero-zero weather, riding out or departing through pea-soup fogs. One of these ships even hovered near its Brazilian destination until a revolution was settled! But largely because of the hydrogen-fire tragedy of the *Hindenburg* —an impossibility on helium-inflated American ships—commercial dirigibles falsely were assumed to be unsafe.

Non-rigids, for which figures are available up to August 1, 1947, have carried 413,256 people on 156,095 flights without scratching a passenger. During her existence, the *Hindenburg* crossed the ocean 37 times, carrying 3,059 passengers. The older and smaller *Graf Zeppelin*, taken out of service after the *Hindenburg* fire because of her highly inflammable hydrogen, made 144 crossings with 13,310 passengers. The old *Los Angeles*, built for the United States as part of the German reparations after the first World War, never wore out—she was merely scrapped after long service. The *Macon* and the *Akron*, both military ships, were lost because of circumstances and conditions that would not be encountered in regular air-line operation.

Great lifting capacity makes the airship an ideal observation post when equipped with most powerful radars for early warning of airborne invaders. Long range and the ability to stay aloft a week at a time would permit military airships to operate above the polar regions, across which our strategists expect possible future attacks. From 10,000 feet, the seeing eye of radar would probe far beyond the horizon. A vast network of ground positions is necessary in that region of difficult transporta-



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BUILD YOUR OWN MOTOR SCOOTER SEE PAGE 118

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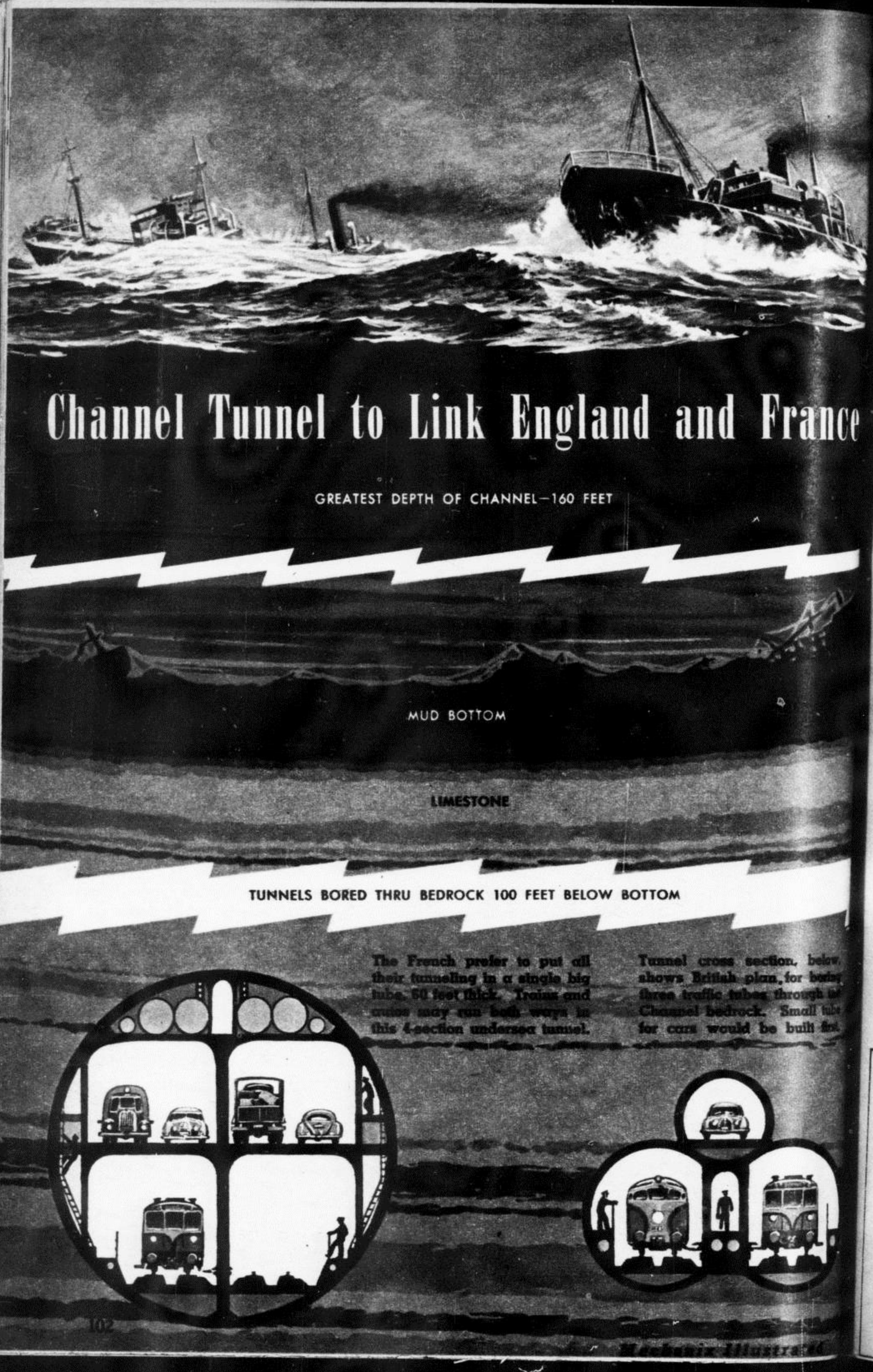
TELEVISION PICKUP by ROCKET

THE guided missile will have uses other than military in tomorrow's civilization. For if we are spared atomic destruction, that dread weapon of push-button war soon will be busy hurtling about the globe on purely peaceful missions.

You'll roam the world in an easy chair, thanks to television pickup units borne in globe-circling rockets. If a ship sinks or a revolution flares in some far country, you'll see all the action from a ringside seat—right while it's happening! A rocket will flash to the spot at 10,000 miles an hour, then hover close to eye-witness the scene for you and relay natural-color pictures to the big half-round screen before you.

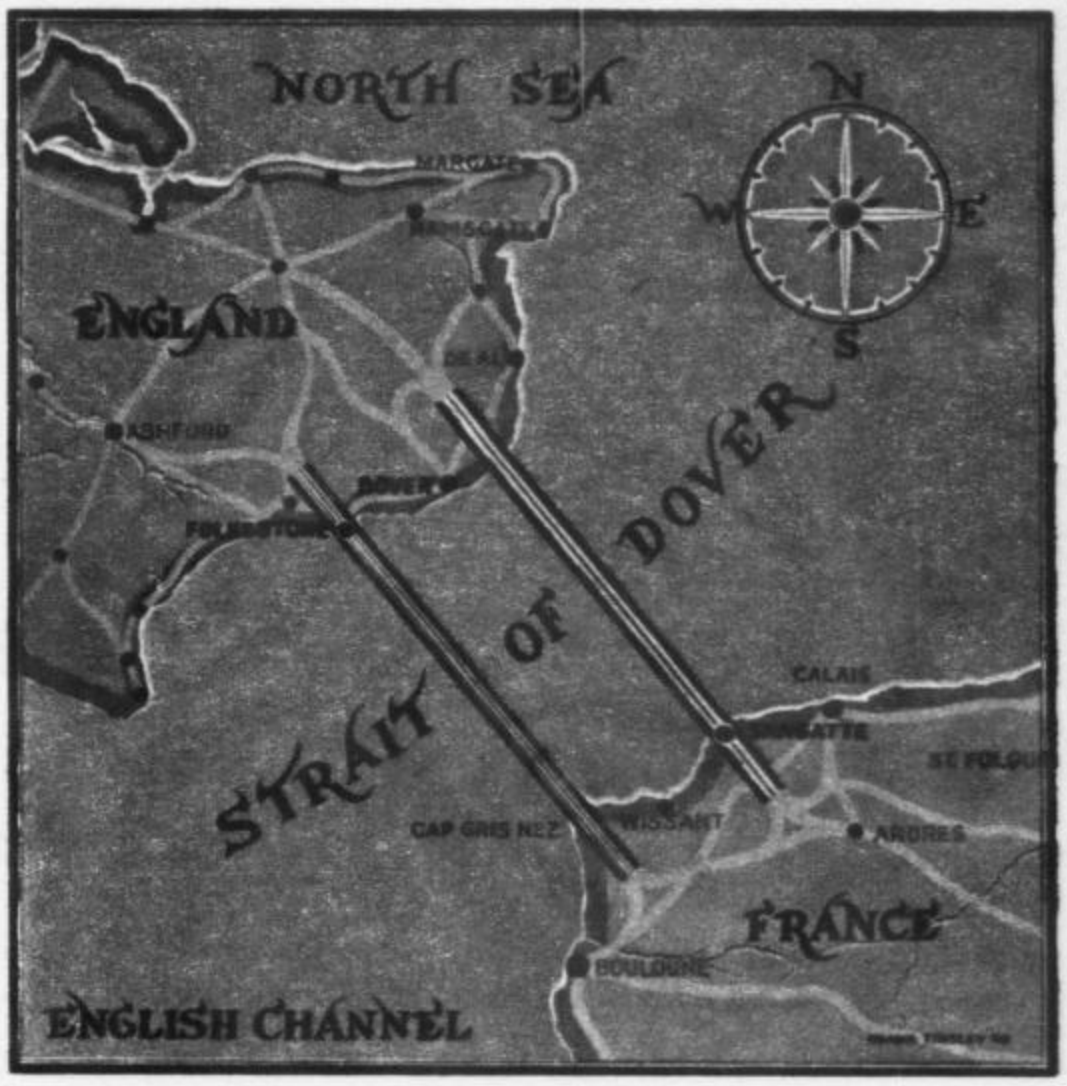
"All this," Eric Johnston, Motion Picture Association head, assures us on the basis of current research by Hollywood's best engineering brains, "will make today's movie theater as old-fashioned as a nickelodeon. We'll sit around a circle in a planetarium-type hall and watch people working at Moscow or penguins catching fish in the Antarctic. We'll be there by guided-missile movies—all projected on a giant dome that will show the action as clearly and as restfully as if we were looking out of an open window into a garden." Maybe we'll all be world citizens then, for we'll know every corner of the earth like our own backyards. •


Channel Tunnel to Link England and France
GREATEST DEPTH OF CHANNEL—160 FEET
MUD BOTTOM
LIMESTONE
TUNNELS BORED THRU BEDROCK 100 FEET BELOW BOTTOM
The French prefer to put all their tunneling in a single big tube, 50 feet thick. Trains and autos may run both ways in this 4-section undersea tunnel.
Tunnel cross section, below, shows British plan for boring three traffic tubes through the Channel bedrock. Small tube for cars would be built first.

BY WILLY LEY

ENGLAND'S days as an island are numbered. Plans are being drawn for atom-proof tunnels under the Channel to link England and France and turn the British Isles into a new peninsula of Europe.

Ever since Napoleon's time, 150 years ago, the idea of bridging "England's Moat" was the ambitious dream of engineers and the fervent prayer of travelers who had to brave the 20 miles of stormy sea that splits England from the Continent. Now British and French experts are working on blueprints for one or more tunnels that will literally weld the island to the mainland. Government engineers figure the cost of such a project at no more than $200,000,000 and the time required for actual building at five to eight years.



Upper "bridge" on map is where the French would bore tunnel. British favor Folkestone-Gris Nez plan.

Oddly, it has been neither financial nor technical trouble that has kept the idea an unfulfilled dream up till now. Money could easily have been available for the tunnel work, and such a tunnel became an engineering possibility more than half a century ago.

Important people in both England and France favored the idea, but politics interfered and prevented the actual building of the tunnel.

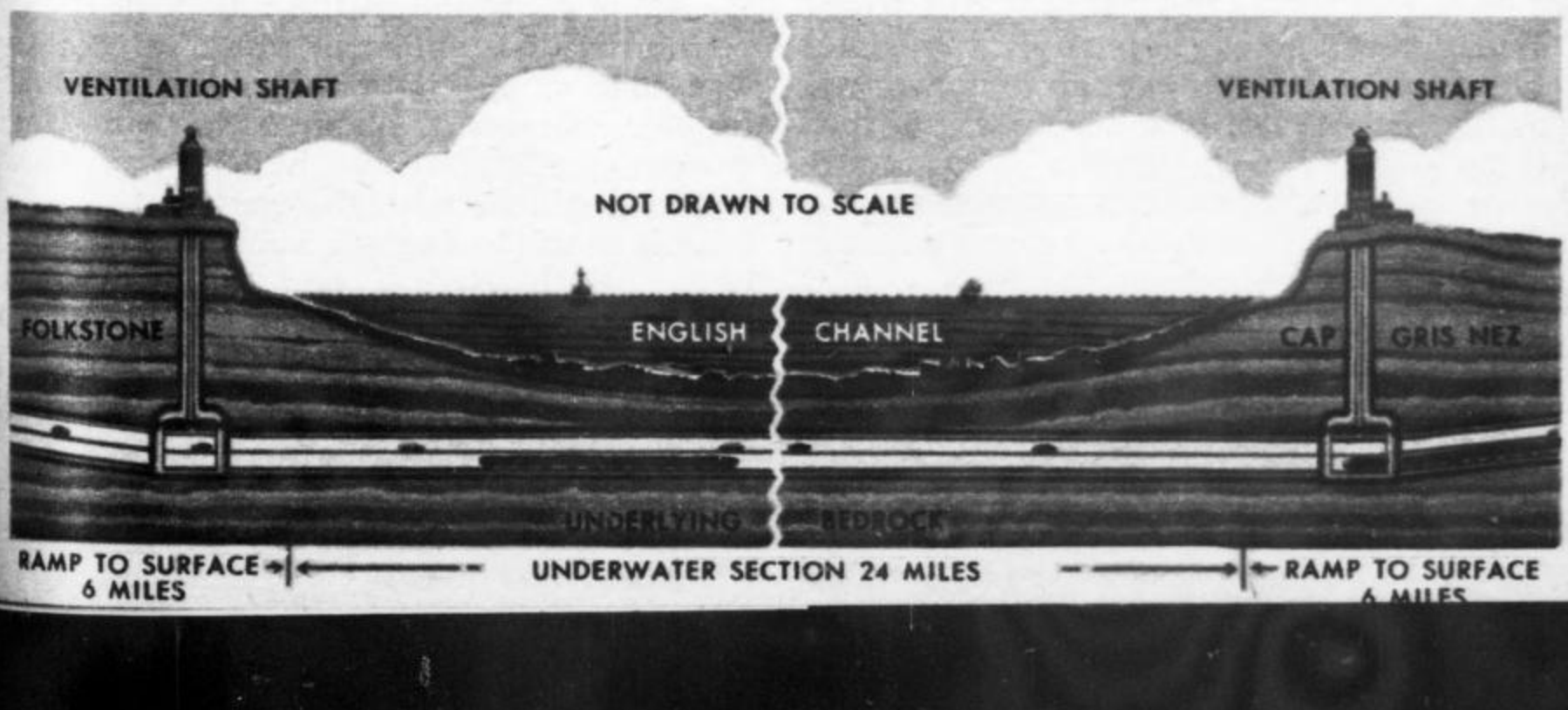
In the days of England's supremacy in sea power, a conservative but powerful bloc of the men that ran the government feared such a tunnel would open Britain to invasion.

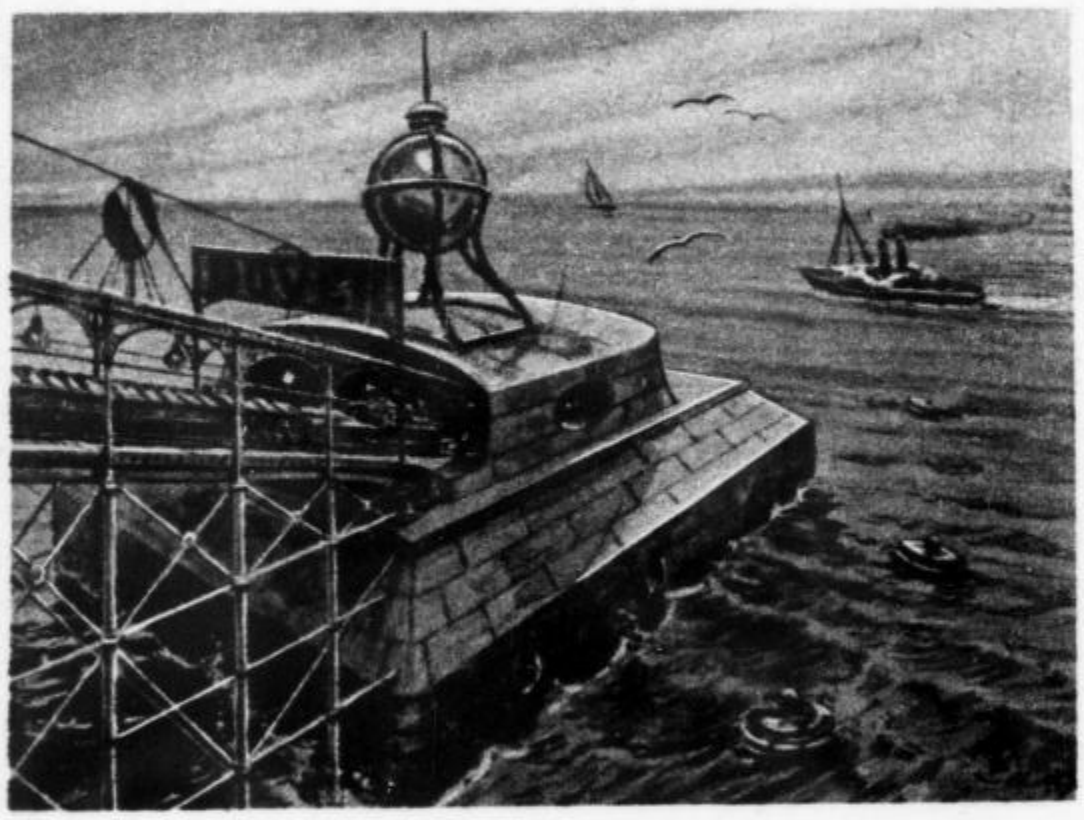
Today the picture has changed radically. It is an air age with military supremacy resting on atom bombs and rockets and jet-propelled planes. Physical isolation is a myth, and England is no longer a sea-protected fortress in time of war but an open target for attack. And with Russia pressing hard against the West, it's growing more and more vital for England and France to unite physically as well as politically to form the core of a powerful western rampart.

As a result, experts of the British and French Governments are now poring over plans for immediate construction of the long delayed tunnel.

Two plans are being studied. The British plan calls for a pilot tunnel 39 feet under the sea bed. Engineers say this would take five years to complete and would cost $40,000,000. Twin railway tunnels would take another three years and cost an added $160,000,000.

The French, on the other hand, prefer a single tunnel about four times the diameter of the pilot tunnel and suitable for both rail and auto traffic. The cost would be about the same.





Tunnel entrance at Dover was pictured like this in 1882 when British sunk a shaft here and dug a mile-long hole.

As an engineering feat, the building of the Channel Tunnel would present no great difficulties. Measured across the most likely route, from Cape Griz Nez on the French side to Folkestone near Dover on the English side, the Channel is about 20 miles wide. The deepest portion of the Channel along that line is 160 feet.

To be absolutely safe, the tunnel should be about 100 feet lower than the deepest portion of the Channel. To reach this depth—some 260 feet below sea level—would require long inclines on both sides and bring the overall length of the tunnel to 30 miles.

Actual construction work on the project probably will be far easier than building the Simplon Tunnel through the Alps. That tunnel, opened to rail traffic in 1906, required years of costly drilling and delicate blasting to bore through its 12 miles of hard rock.

In contrast, both the French and British coast bordering the Channel rest upon the same layer of gray sandstone, which begins 30 or 40 feet under the Channel bed. From the engineer's point of view, this sandstone layer is ideal. It's soft enough to be worked easily, but it's still waterproof, so that seepage will be no problem.

The only real problem is to get the British and French to agree on a single plan for the tunnel. In addition to the difference in tunnel plans—French blueprints call for one tunnel about 60 feet in diameter, and the British favor a scheme for three tunnels, each 12 feet in diameter—there is another minor difference of opinion. Some experts urge a cast-iron lining, while others—including Commander Christopher Powell, the British delegation's spokesman—argue that a concrete lining would work better. The cast-iron lining, incidentally, would increase construction costs by $60,000,000.

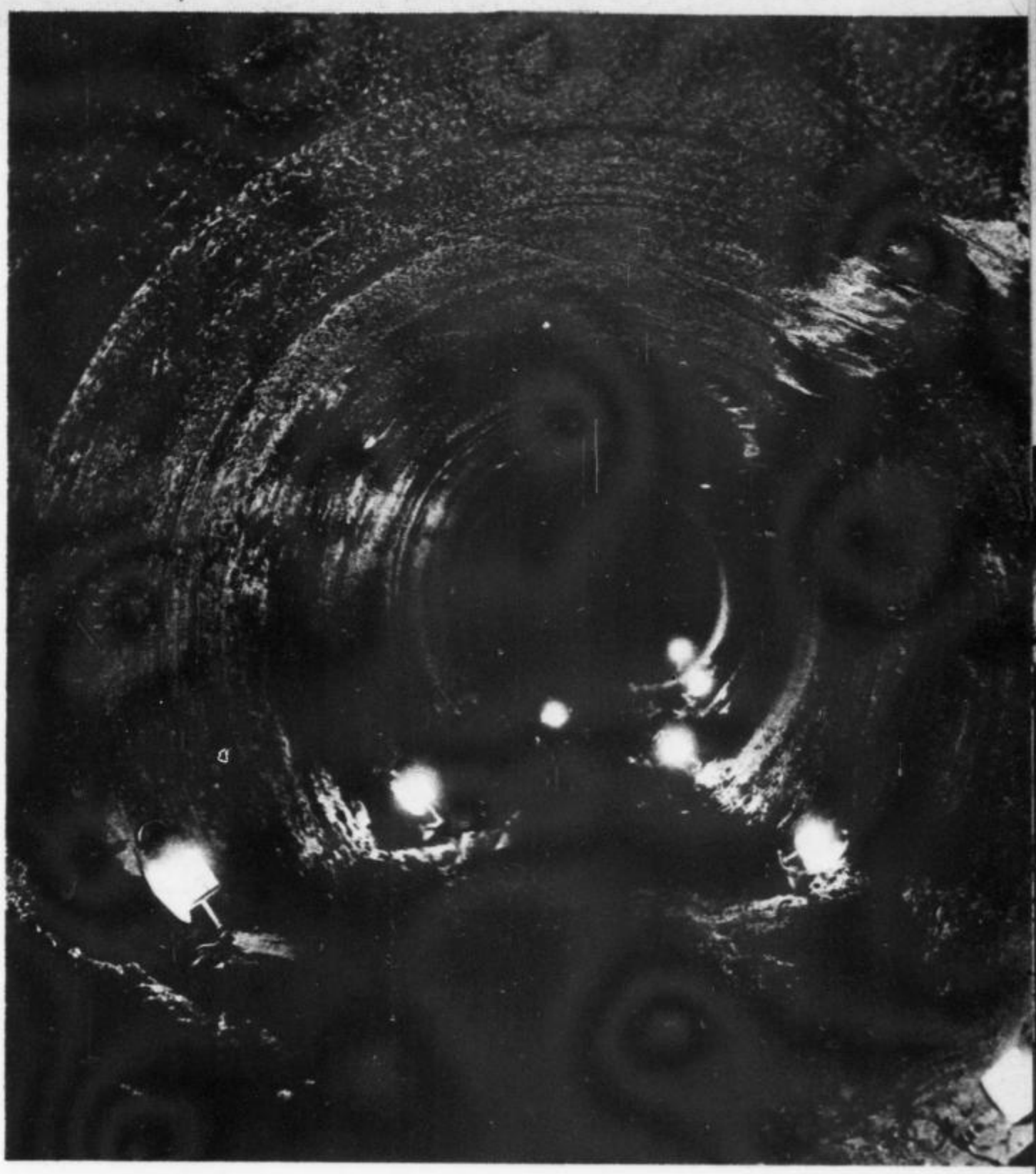
The idea of the Channel Tunnel originated in 1802. In that year, the French engineer Mathieu-Favier submitted a plan for such a tunnel to the First Consul of the Republic, Napoleon. Napoleon was enthusiastic, and discussed the matter with the British ambassador. Then growing friction between the French and British, preceding the Napoleonic wars, killed this scheme.

Some thirty years later a British engineer named Dunn came up with another plan. Rather than a tunnel drilled beneath the Channel bed, he suggested a tube made of a series of cast-iron pipe sections laid along the Channel bottom. Nothing came of it—until over a century later. Then, a similar idea popped up and was actually used during the last year of World War II. Under the code name PLUTO (*Pipe Lines Under The Ocean*), a big tube was laid down to carry gasoline to the troops invading France.

Following the Englishman Dunn, it was France's turn to come up with an idea. Two engineers, Ransonnet and Polonceau, wanted to build a bridge across the Channel, a feat which they said they could do for a billion gold dollars. Then came another plan for a tunnel by Thomé de Gamond, who spent his entire fortune and the better part of his life working over plans. Napoleon III greatly encouraged him, possibly because his uncle Napoleon Bonaparte had himself liked the idea, but the plans remained in the blueprint stage.

One major problem in those early days was that of ventilation for the proposed tunnel. Gamond planned to take the excavated material and build up thirteen artificial islands with this material. These islands were to contain ventilation chimneys. Both British and French naval officials protested strongly against anything that would make Channel navigation even more hazardous than nature had already made it.

Yet it was Gamond's persistence that



Here is an authentic photo of a portion of the first Channel tunnel which is bored deep into the chalk cliffs of Dover.

started the first *actual* work on a tunnel. In 1872 he founded a Channel Tunnel Company—which, incidentally, still holds meetings. Plans were submitted to both the British and French Governments. Ten years later, excavations began. On either side of the Channel, near Shakespeare Cliff in England and near Sangette in France, engineers sunk a 400-foot shaft and started tunneling from the bottom of each shaft. Work progressed for a mile on either side until it was brought to an abrupt halt by orders of the British Chief of Staff, General Wolseley.

A tunnel, he felt, would bring with it the danger of invasion. He repeated the previous words of Lord Palmerston on the tunnel project:

"How can you expect us to further reduce a distance which is too short as it is?"

That attitude became a definite part of British policy, and effectively blocked further Channel Tunnel developments, although with the years advances in engineering and construction work made previous technical problems negligible.

The project was rejected by the British Premier Campbell-Bannermann in 1906. It was rejected by Lord Asquith in 1914. The same idea was rejected again in 1920 by Lloyd George, and by Ramsy MacDonald in 1924.

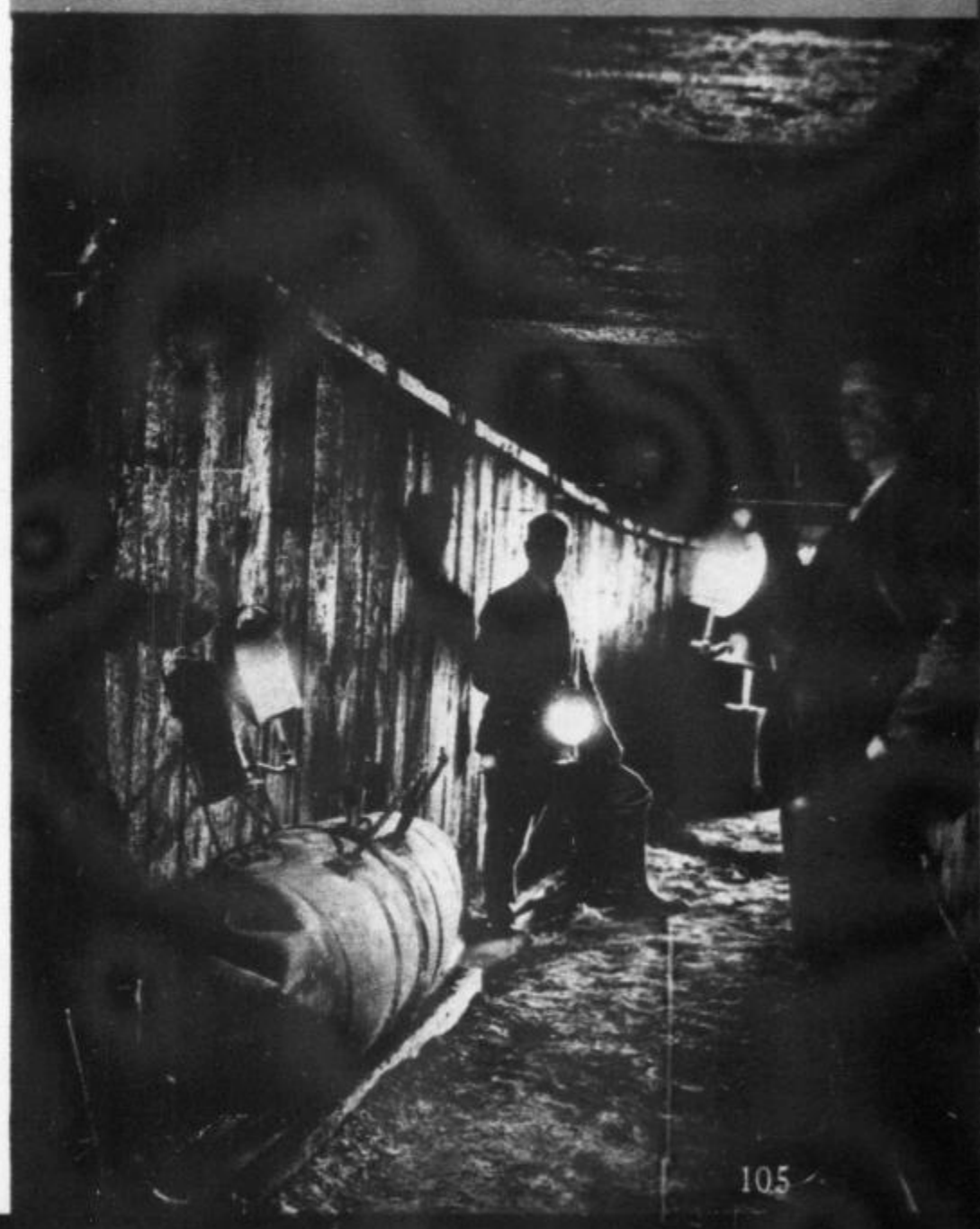
More forward-thinking men fought in vain against the conservative hesitancy of Britain's policy makers. Winston Churchill argued for the tunnel. Marshal Foch, in 1922, reminded Britain that a Channel tunnel might well have prevented World War I.

It took World War II to prove these conservatives wrong and the tunnel advocates right.

With the politicians agreed, the engineers now stand ready to take over. And one more Jules Verne fancy will shortly become a fact. •

June, 1948

Below, crew makes periodic inspection of shaft leading to tunnel entrance under the English Channel.



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See Page 106

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Why Don't We.... STREAMLINE THE

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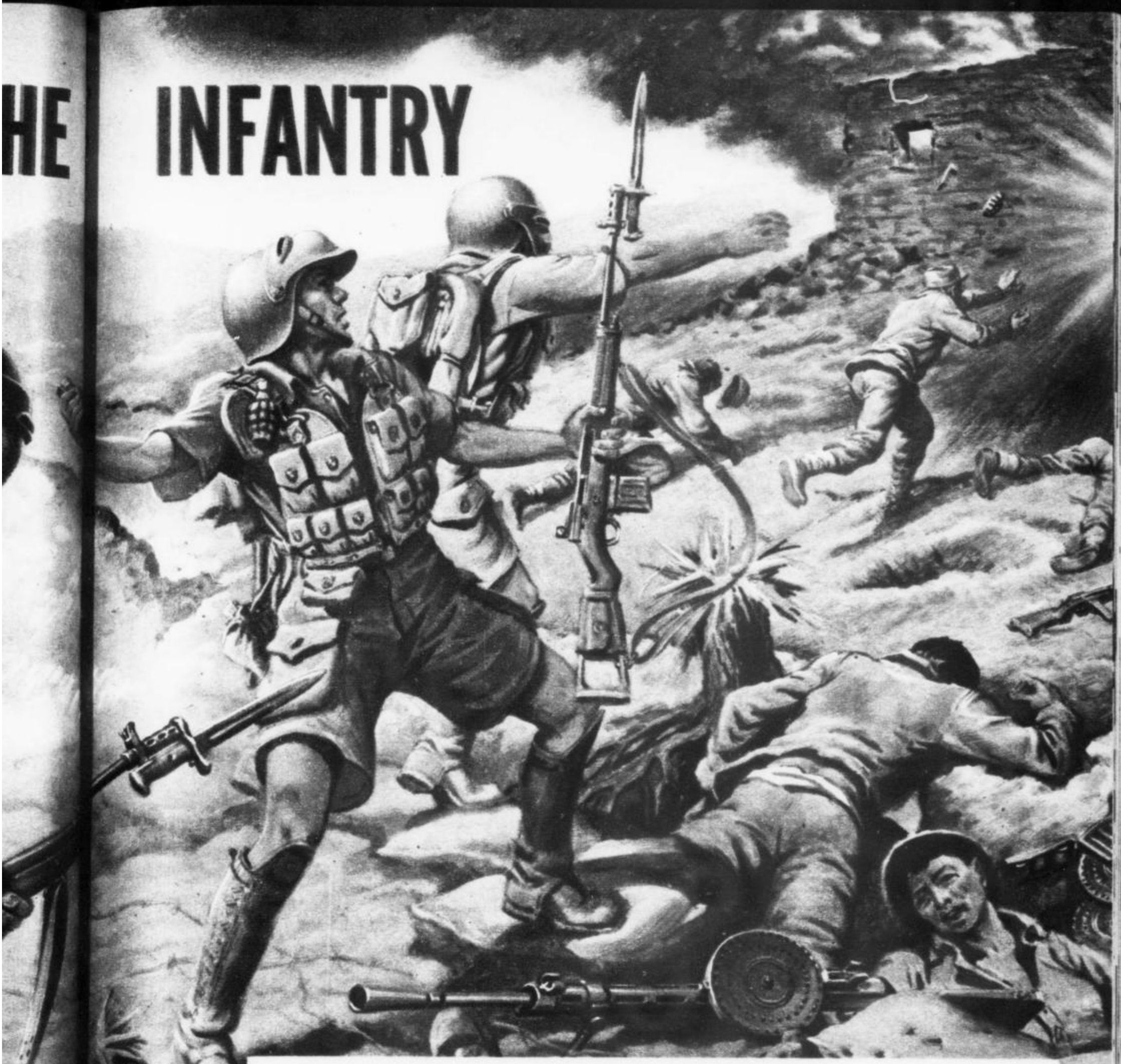
INFANTRY



We owe our fighting GI's the lightest, most efficient, safest equipment modern science can devise.

By Frank Tinsley

WHY don't we streamline the infantry?

Why don't we cut down drastically on the weight of ammunition, weapons, equipment and other paraphernalia the doughfoot has to lug around—and at the same time give him lightweight head and body armor that will protect him from enemy gunfire without interfering with his speed of movement?

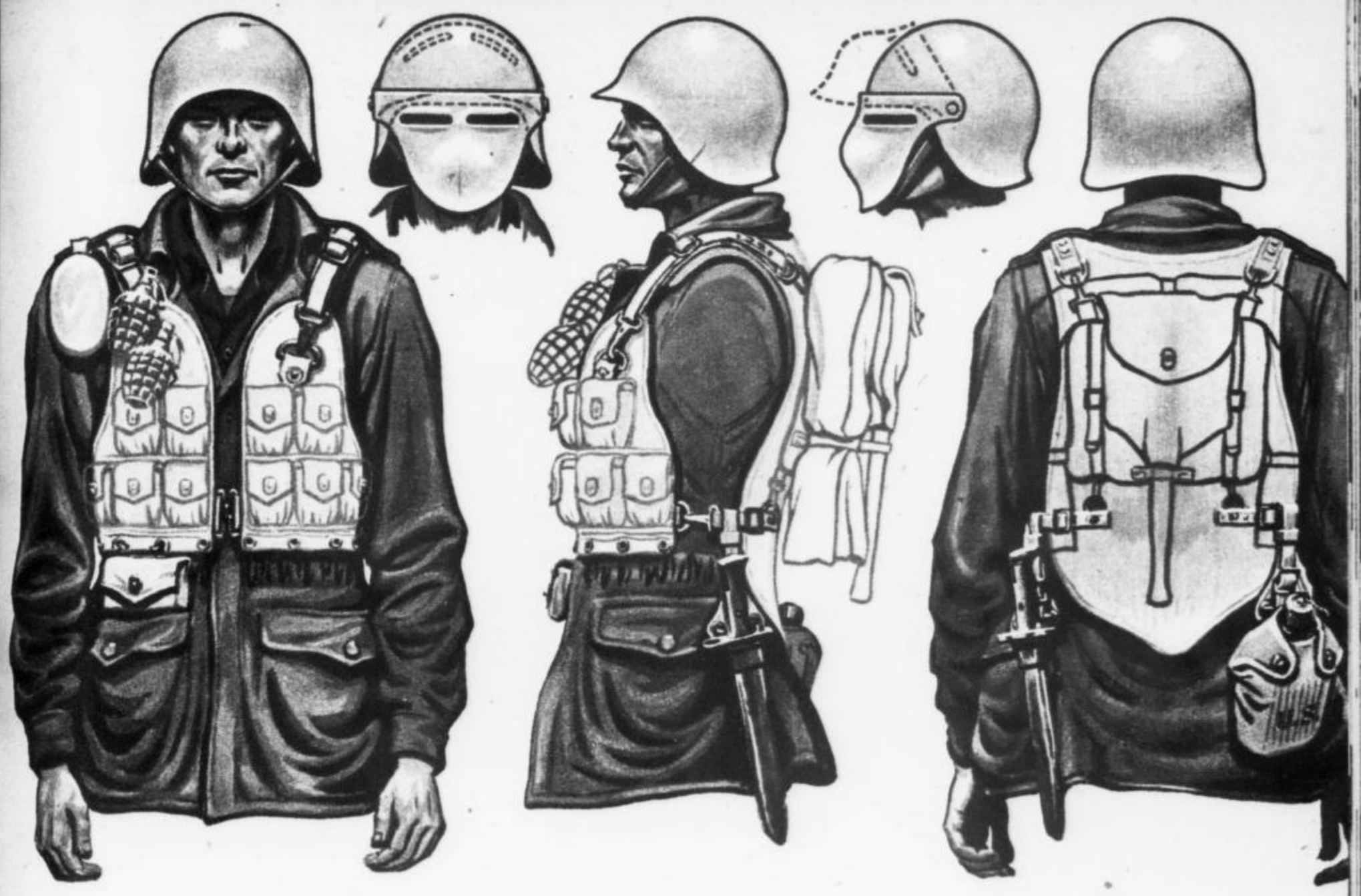
Actually there are many things that are being done—and many more that can be done—to make G.I. Joe a faster moving,

Nylon, bullet-resistant body armor withstands tommy-gun slugs at point-blank range. Photo below shows where fragments from grenade exploding three feet away bounced off a piece of Doron.

harder hitting, and less vulnerable fighting man.

Right now our army labs are hard at work protecting him from enemy gunfire. An Armor Section of the Quartermaster Corps has been functioning ever since Pearl Harbor to devise better helmets and body defenses. Scalp-calloused veterans of World War II will be happy to hear that the heavy steel wash basins of that conflict are about to be replaced with a lighter, stronger head guard. It is made, believe it or not, of nylon! Not the filmy gauze that decorates milady's gams, of course, but a more rugged edition of the stuff, called Doron.

This newly developed plastic is miles ahead of the armor steel previously used. It has approximately twice the resistance of the best manganese alloy with only half its weight! Furthermore, unlike metal, it does not indent half an inch when clipped by a hunk of flying shell casing. This



FRANK TINSLEY '52

Rubber recoil pad is on right shoulder. Nylon helmet is lighter, stronger, protects more of head. Visor protects face, eyes.

Armored ammunition and pack carriers are adjustable. Pack snaps to dee rings, is dropped without removing the armor.

Weight of pack is distributed over padded backplate as in Adirondack pack carrier. Rubber pads under straps ease pull.

means that the former safety space of one inch from skull to steel is no longer necessary and the helmet can hug the head more closely. A more compact and better balanced design is the result. The new Doron job covers more of the head, weighs only about one and a half pounds and resists projectiles with velocities of over 1,000 feet per second. This includes practically everything slower than a high-powered rifle bullet, the low velocity stuff which accounts for more than 75% of all battle casualties.

Another snappy item from the Doron haberdashery is a modernized version of the Chicago "weskit" or bulletproof vest. This handy little life-insurance policy covers its happy possessor from neck to midsection and weighs about eight pounds. It is made up of 20-odd thicknesses of Doron cloth, cut to pattern by standard tailoring machines and fastened together into a close fitting garment. Multiple dies then apply heat and pressure to little hexagonal areas spaced throughout the inner plies of the vest. This fuses the plastic cloth into a series of metal-hard islands surrounded by soft fabric. This waffling process keeps the Doron from bunching or puffing and at the same time preserves flexibility.

The portions of the jacket covering the spine, ribs and collarbones are cushioned on the inside with foam-rubber pads. Soft parts of the body absorb the shocks through their own natural "give." A pistol bullet can punch the Doron into a man's belly an inch or more without going through or breaking the skin. About 1,400 of the vests are now on their way to Korea for issue to a regimental combat team.

The only unfortunate angle of the body-armor development program is the fact that the vests, pocket plates, etc., have been designed as extra equipment that *adds* to the soldier's total load. No attempt has been made to integrate armor with the rest of the infantryman's basic equipment so that at least part of its weight can be cancelled off. There is no reason why Doron breastplates cannot be faced with ammunition pockets to eliminate the web belt and suspenders. A padded backplate could double in [*Continued on page* 170]

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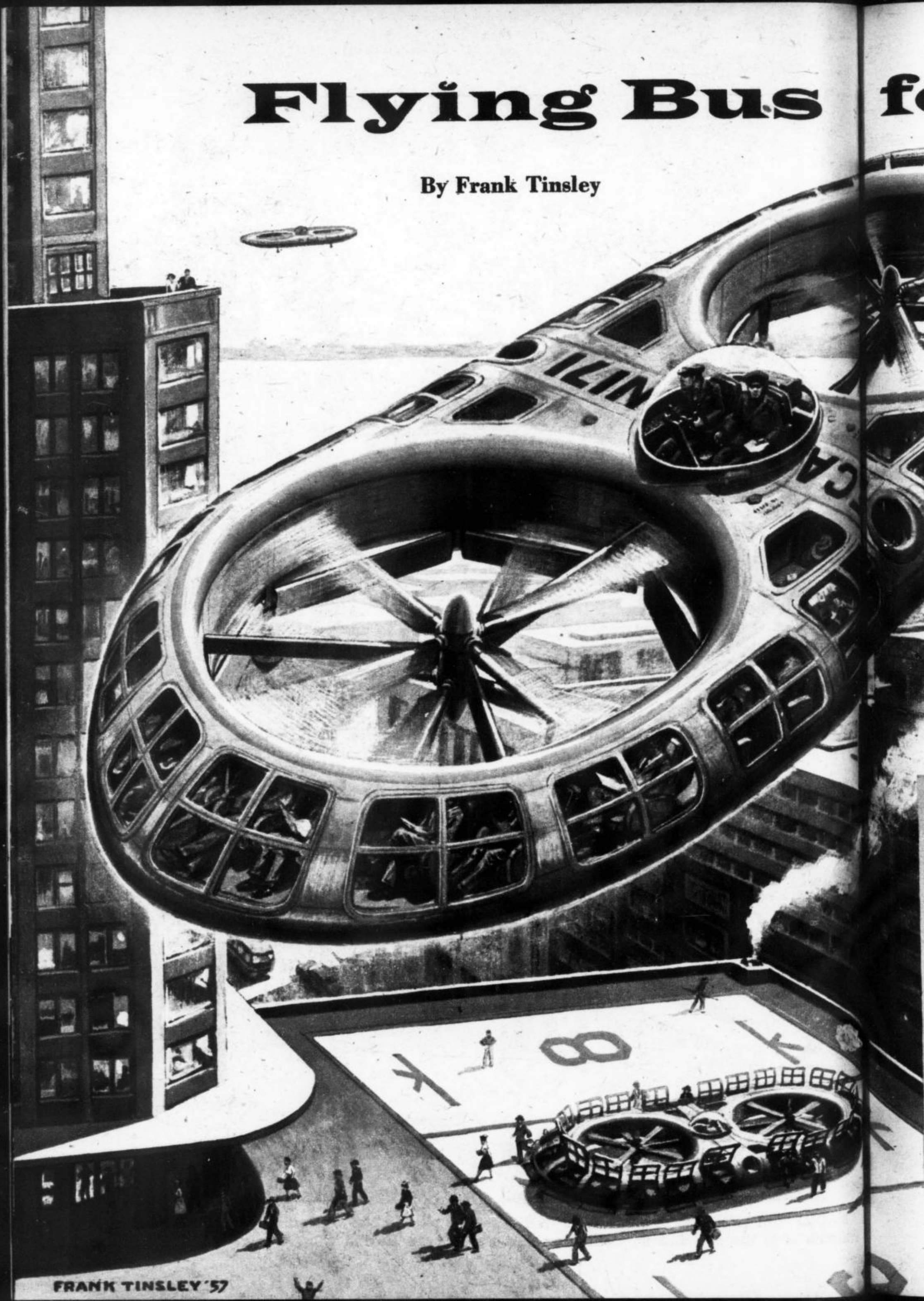
Flying Bus

By Frank Tinsley



for Commuters

FLYING PLATFORM principle would be used to power practical Commuter Bus.

WHEN you first see it in the sky it looks like an outsized life raft. As it approaches the heliport and slowly begins its vertical descent to the landing pad, you gape at the engines which look like a pair of huge, doughnut-shaped fans.

When the craft settles down on its pad the Plexiglas doors with the big bay windows swing upward and 40 relaxed and smiling commuters step out, ready for another day in the teeming metropolis. MI's Flying Bus for Commuters has landed.

The principle by which this unusual aircraft operates is amazingly simple. Christened the ducted fan flying platform you've been hearing so much about of late, it was originally dreamed up by Charles Zimmerman, a former engineer with the National Advisory Committee for Aeronautics.

Zimmerman's novel whirligig is a cross between a rotor and airplane propeller, whirling inside a ring open at both ends. Sucking air in through the top, it vents it at high speed through the bottom and literally blows

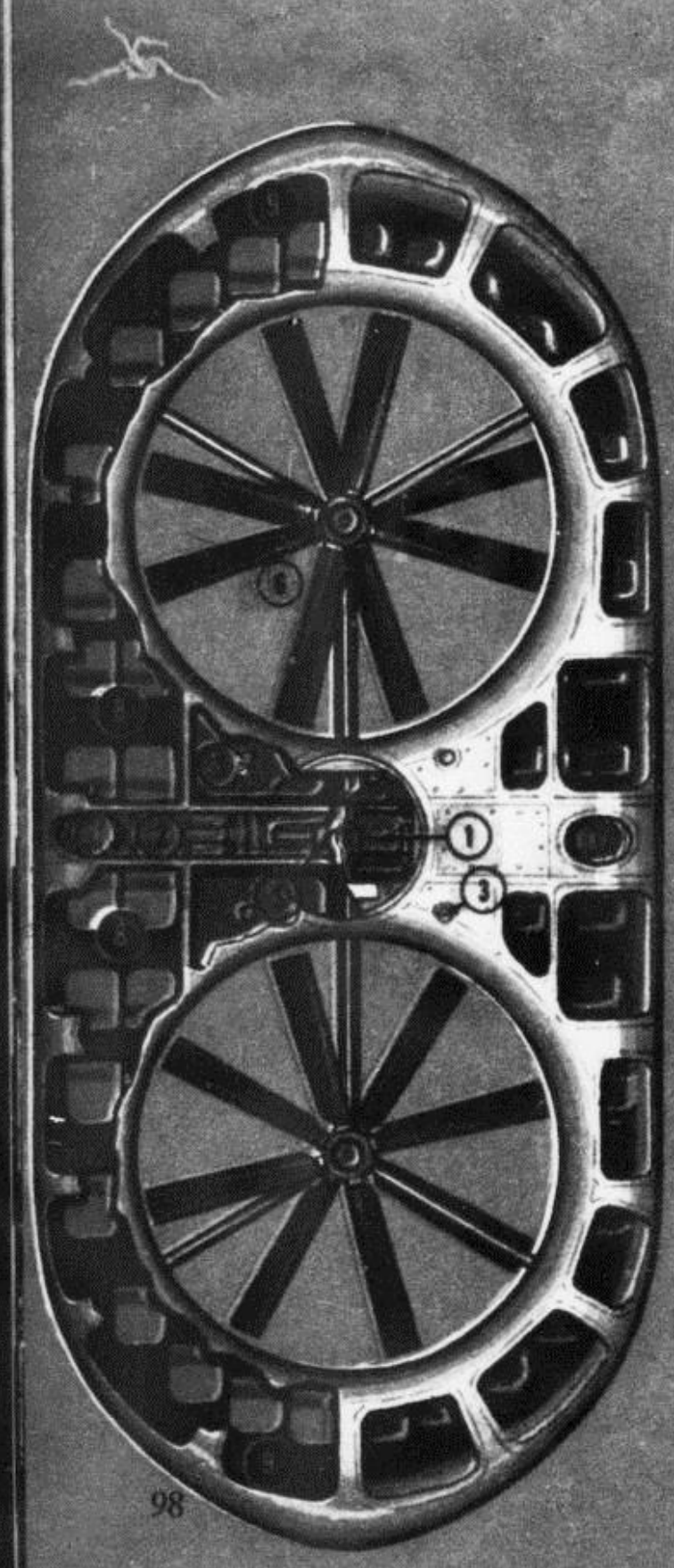
itself off the ground on a column of air.

MI's editors have been watching the development of Zimmerman's machine and, looking into the not too distant future, see it in the form of a safe, reliable and practical means of transportation—particularly for short distance transport of passengers and freight.

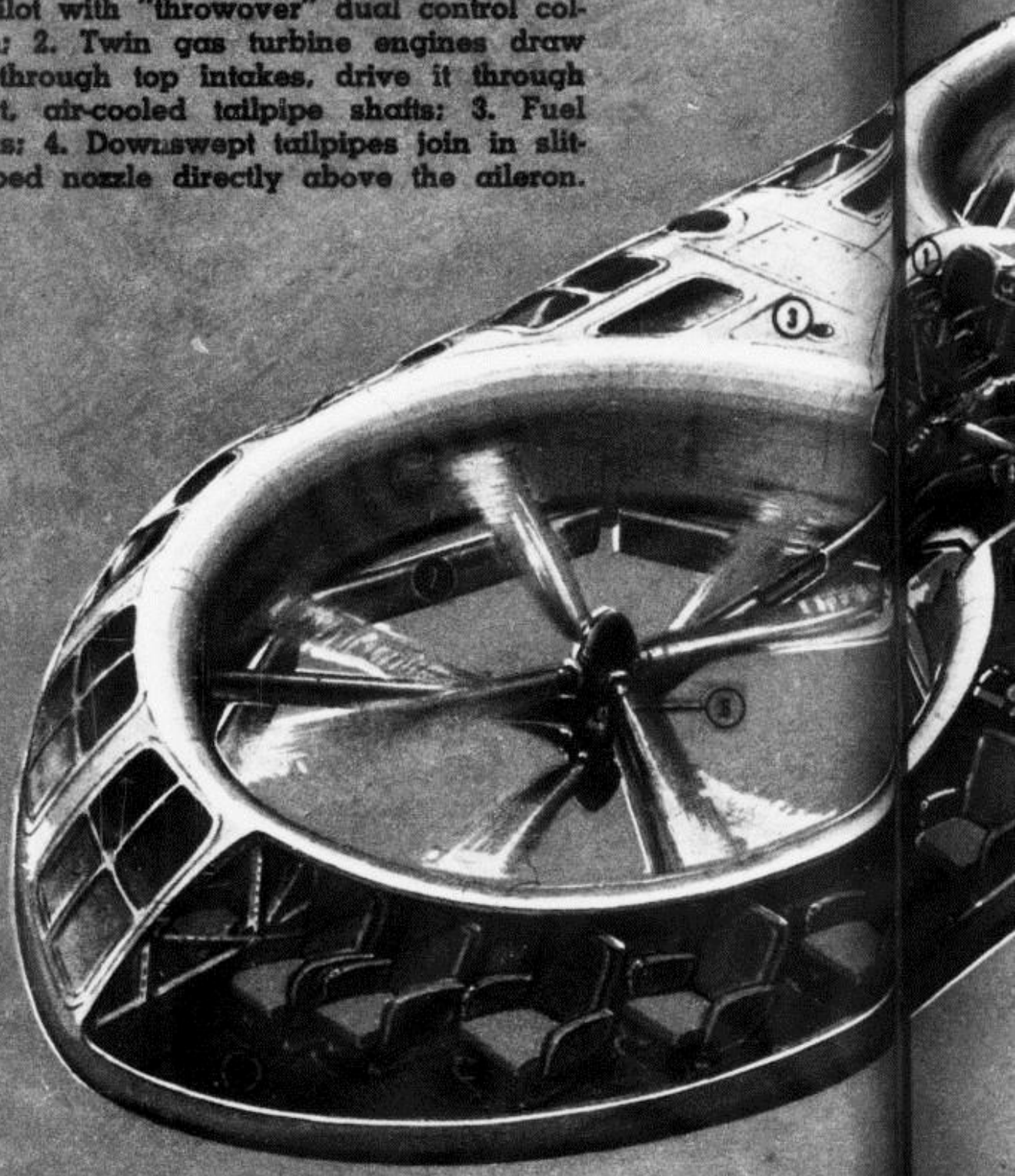
The Flying Commuter Bus is a watertight life ring measuring 53 feet in length and 24 feet in width. It is designed so that land and water take-offs and landings are possible in perfect safety. It is powered by two gas turbines driving the lifting fans through interconnected gearing and shafting. Either turbine can drive both fans and maintain altitude.

Operation is simple. Air is drawn into engine intakes on either side of the center section. Compressed and heated, the air then whirls twin turbine wheels, the first of which drives the compressor. The rear (power) wheel turns a short shaft connecting directly with the central gearbox. This shaft, working off the "hot" end of the engine, is protected by a cooling jacket which also encloses the gearbox. Air, bled off the first compressor stage, circulates through this and keeps the temperature within safe operating limits.

The tailpipes of both engines curve downward to the underside of the machine and join in a slot-shaped nozzle. This extends longitudinally along the center line with an "aileron vane" mounted beneath and operating in its exhaust stream. Positive lateral control is thus assured. The stream also adds to the total lift. From the gearbox linked drive shafts extend fore and aft to turn the four-bladed, contra-rotating fan units. These are syn-



DETAILS of MI's Commuter Bus design and construction are shown in this diagram. 1. Bubble-enclosed cockpit for pilot and co-pilot with "throwover" dual control column; 2. Twin gas turbine engines draw air through top intakes, drive it through short, air-cooled tailpipe shafts; 3. Fuel tanks; 4. Downswept tailpipes join in slit-shaped nozzle directly above the aileron.



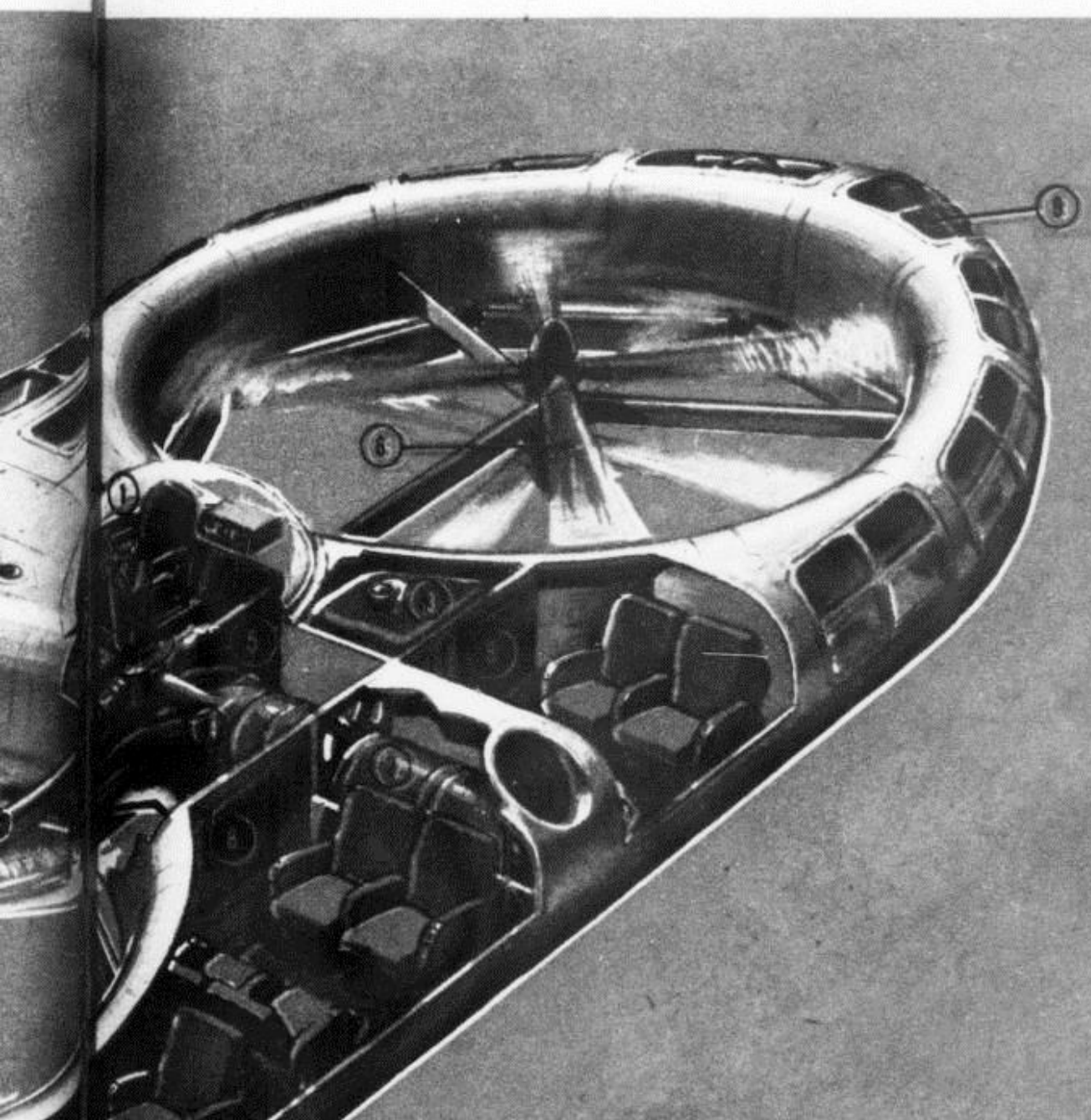
chronized for equal lift. Mounted on the bottom edge of each duct is a circle of directional vanes which direct the aircraft's flight. It can move forward, backward or sideward at any angle and is flown from a bubble-enclosed cockpit situated between the ducts. A pilot and co-pilot operate the machine.

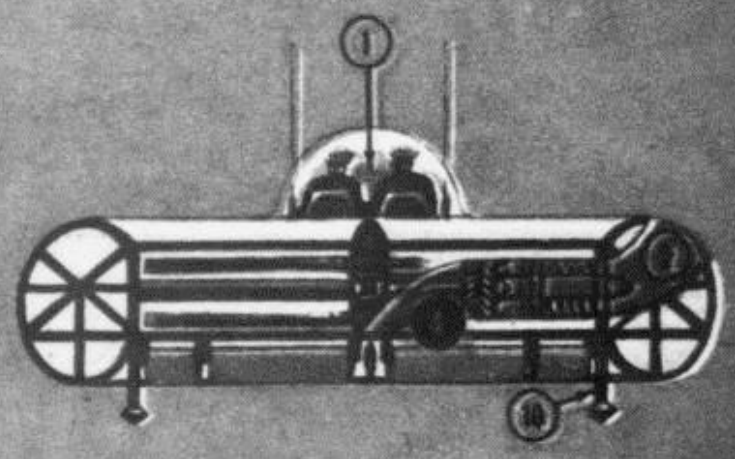
Passengers ride in adjustable seats arranged in a single row around the ducts. Four large bays in the center section seat four in facing chairs and each is equipped with a folding table recessed in the rear wall for business conferences or card games. The Plexiglas door-windows provide an unexcelled view. Functioning like the compartment cars on European trains they permit simultaneous loading or unloading via folding steps recessed into the lower face of the life-ring during flight. These door-windows open automatically upon landing. Incidentally, the lowness and width of the Commuter Bus make it extremely sturdy even in the roughest seas and it could easily be adapted to rescue work.

For normal heliport operations four short shock absorber legs support the machine holding it 18 inches off the ground. This unique layout requires no interior aisles and the short trips make toilet facilities unnecessary.

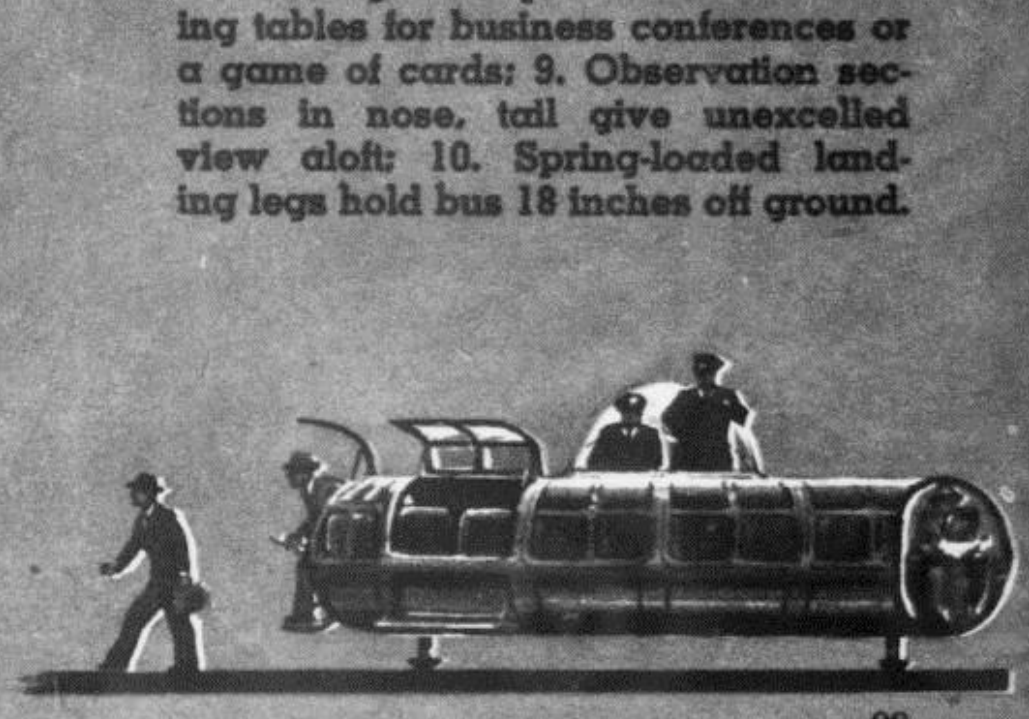
Our commuter would drive to his town heliport each morning, board the 100-mph Flying Commuter Bus, land at a riverfront or rooftop traffic center near his office, debark and walk to work.

The ducted fan aircraft may well replace the helicopter, long believed to be the commuter vehicle of the future. When and if it does, suburbanites will travel to and from work on a magic flying carpet. •





5. GEARBOX and drive shafts interconnect with fan units which either engine can drive; 6. Fan units. Contra-rotating, four-bladed propellers are enclosed inside ring open at both ends; 7. Movable vanes deflect air blast to control direction and speed; 8. Passenger compartments with folding tables for business conferences or a game of cards; 9. Observation sections in nose, tail give unexcelled view aloft; 10. Spring-loaded landing legs hold bus 18 inches off ground.



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FRANK TINSLEY '57

MI STIRS UP THE

LAST February MECHANIX ILLUSTRATED ran a cover story titled Let's Claim The Moon—Now! in which writer Pierre J. Huss warned the United States to get a flag-carrying rocket off to the Moon soon because the Russians, by their own admission, planned to make it a "suburb" of Moscow by 1970. The story really kicked up a commotion among the hyperthyroid Big Domes of the Kremlin. Trud, the "peace-loving" official daily newspaper of the USSR's All-Union Central Council of Trade Unions, took frantic note of the MI article with a story headlined A Rocket Flies To The Moon.

The Russian paper snorted that Huss is "very worried because most American rocket specialists propose that a grandiose manned artificial satellite should be established in the cosmos first." Only then could a huge inter-planetary ship be sent to the Moon. "To do this the United States requires no less than 30 years," Huss quoted the experts.

But, says Trud, a Russian scientist named Yu. S. Khlebt-

COVER STORY which appeared in February '57 issue of MI is pictured below. Story made Red paper Trud sit up and take notice.

LET'S CLAIM THE MOON—NOW! COVER STORY

We can beat the Reds with this plan for shooting our flag to the Moon by rocket.

By Pierre J. Huss

THE RUSSIANS, by their own admission, are getting ready to claim possession of the Moon. By 1970, judging from known Soviet plans for shooting rockets into the skies, the Moon will become sovereign territory of the Soviet Union—a "suburb" of Moscow.

Obviously, then, now is the time for us to stake out our claim to the Moon if the interests of free mankind are to be safeguarded for future generations. Otherwise, the Russians will beat us to the punch by grabbing first and talking afterward.

American ingenuity and enterprise and our scientific and technical know-how should be mobilized into a giant effort to overcome the obstacles and give the U. S. the honor and glory of staking out a claim to the Moon by planting the Stars and Stripes on lunar ranges and valleys via rockets!

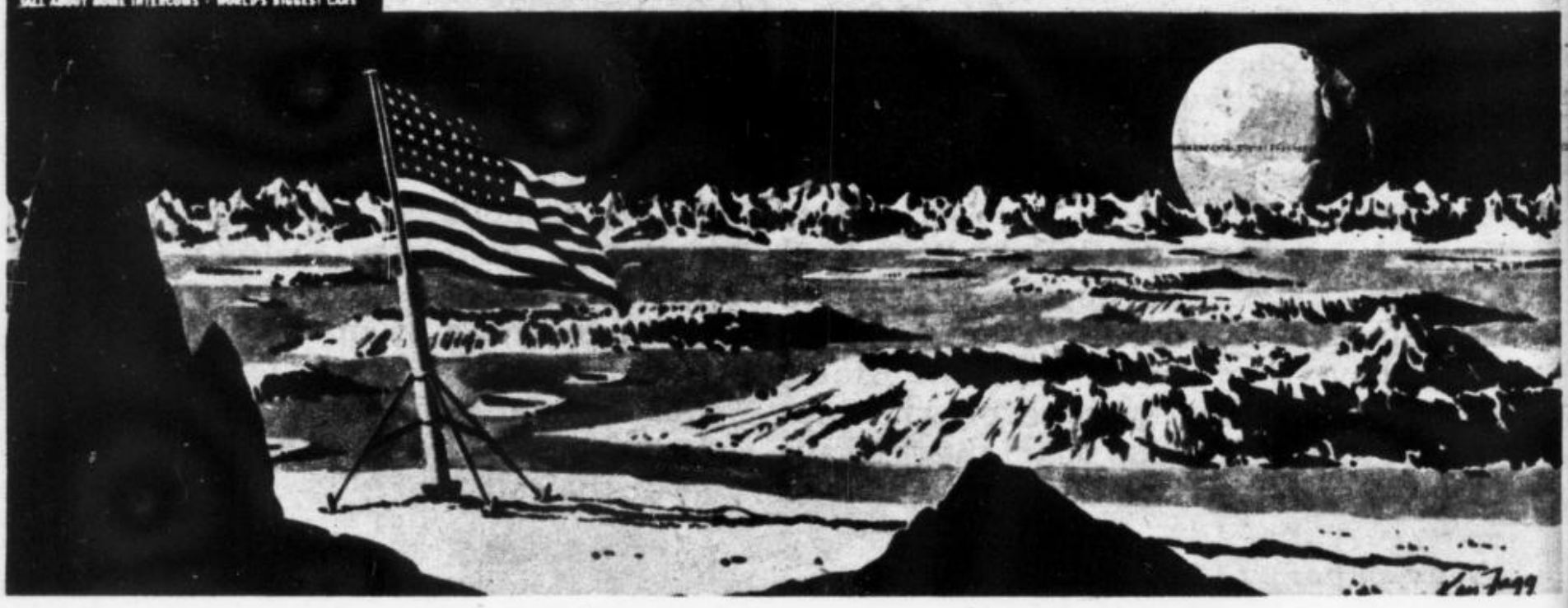
The Moon is so great a prize in shaping principles concerning space and interplanetary rights that now is the time for the U. S. Government to act boldly. Congress should issue an immediate proclamation establishing jurisdiction over the Moon by right of first contact. The flag could follow as the clincher.

The first contact—and even the Russians haven't claimed this—was made with the Moon by the United States Army Signal Corps on January 10, 1946. Lieutenant Colonel John H. DeWitt made the historic contact by radar at Evans Signal Laboratory, Belmar, N. J. The powerful radio impulse shot at the Moon echoed back in two and one-half seconds, a round-trip of 477,000 miles. Here, then, is the first legal basis on which the United States Government can pin a technical claim of jurisdiction.

With the right of jurisdiction established, the U. S. Army Signal Corps, or any other interested governmental

Last stage of rocket fires stalled flag which is set firmly on moon's surface.

International law recognizes ownership claim after nation's flag has been established.



РАКЕТА ЛЕТИТ НА ЛУНУ

Беседа с кандидатом технических наук Ю. С. Хлебцевичем

Советский ученый Ю. С. Хлебцевич сделал несколько лет тому назад в секции астронавтики [illegible] Центральном аэроклубе имени В. П. Чкалова доклад о радиотелеуправляемых космических ракетах. Он предложил проект посылки на Луну радиотелеуправляемой ракеты, которая, будучи посажена на Луну, [illegible] там управляемую с Земли ракетку-лабораторию, снабженную [illegible] телевизионной установкой и [illegible] приборами для исследования лунной атмосферы и лунной поверхности.

Недавно в американском журнале «Миканикс иллюстрейтед» опубликована статья некоего Пьера Дж. Хаса. Его очень беспокоит, что большинство американских специалистов ракетчиков предлагают сначала создать в космическом спутник с [illegible] на нем и затем, отправив [illegible] на Луну [illegible] менее 30 лет будет осуществлено Ю. С. Хлебцевичем. [illegible] осуществить [illegible] меньше.

В связи с [illegible] СССР [illegible] космический корабль [illegible] ближайшую к нам [illegible] на основе действующих [illegible] народных законов [illegible] новый остров [illegible] принесут нам [illegible] ну. Риск потерять [illegible] пространстве [illegible] Луны представляется [illegible] чему бы нам [illegible] такие усилия, [illegible] Луне».

Автор статьи [illegible] спешит убедить [illegible] настало время [illegible] Луну, если мы [illegible]

Недавно я беседовал с кандидатом технических наук Ю. С. Хлебцевичем. Вот что он рассказал:

— Полет на Луну может быть осуществлен в течение ближайших пяти десяти лет. Реальность такого полета опирается на прочный научный фундамент. Особенно после старта за полетом ракеты будут следить несколько радиолокационных станций автоматического сопровождения. Работая совместно с бортовой аппаратурой ракеты, они с высокой точностью определят ее координаты. Данные поступят в электронный счетно-решающий прибор, который при отклонении ракеты «высчитает» необходимые поправочные радиокоманды. Полет ракеты может быть осуществлен с промежуточными заправками топливом. Это будет сделано с помощью автоматических, также управляемых по радио, ракет-заправщиков.

Телевизионная передача с Луны будет похожа на обычную внестудийную передачу телевидения. Миллионы телезрителей Земли смогут увидеть ее на экранах своих телевизоров. Ведь малая дальность обычных телевизионных передач объясняется тем, что ультракороткие радиоволны не способны огибать Землю. С Луны же прием передач через телецентры вполне возможен, конечно, при создании специальной аппаратуры, разработанной нами.

В дальнейшем танкетка-лаборатория поможет ученым выбрать наиболее удобное место для посадки на Луне ракеты с людьми. Радиотелеуправляемые ракеты до[illegible] специальное обо[illegible]здуха и пита[illegible]ы на выбран[illegible]юстанции тан[illegible] будет слу[illegible]требует значи[illegible]ем по [illegible]мери[illegible]

[illegible]омощи радио[illegible]тории, ска[illegible] О. С. Хлебце[illegible]ринципиальных [illegible]ехнической тех[illegible]ники радиоте[illegible]

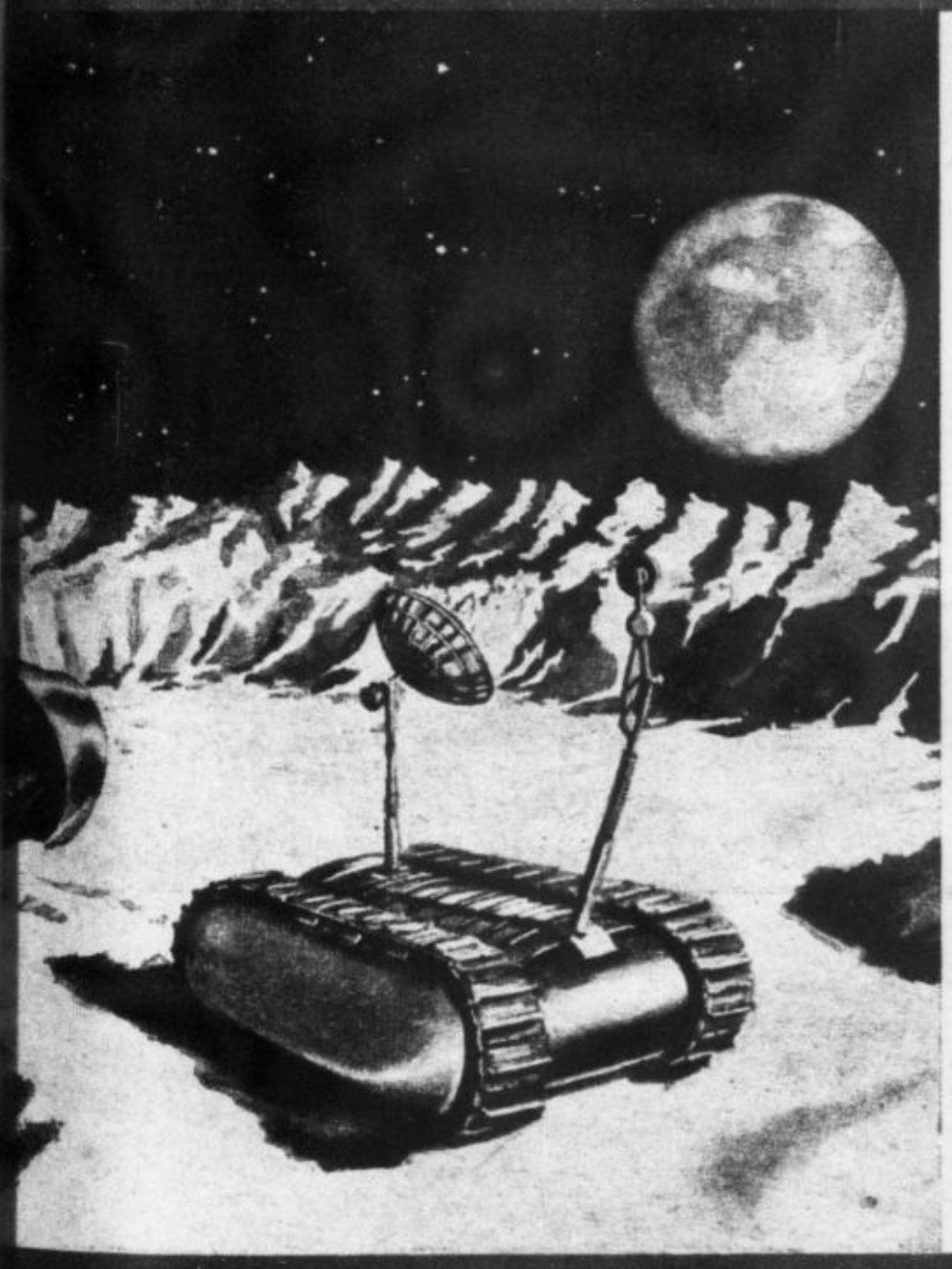
[illegible]ера Дж. Хас[illegible]а Луну теперь [illegible]тка. Цель со[illegible]постройка во[illegible]грожать оттуда [illegible]мерики. Наши [illegible]ики направле[illegible]скорее проник[illegible]пространства, [illegible]ь необъятную [illegible]конечно, могли [illegible]США и других

sevich, figures the Reds will be Moon-bound in five to ten years. Khlebby describes how a rocket, controlled from Russia, will land on the Moon a mobile tankette laboratory that will travel on caterpillar treads. This unmanned Russian tank-laboratory, directed from the Earth via radio, will contain a transmitting television camera. With its help the clever Red scientists will be able to examine and photograph the Moon's surface and the lunar sky. Here on Earth millions of viewers will be able to watch the whole thing on their home TV screens.

Trud adds, "As for the (MI) article . . . it is incomprehensible to us. It is by no means the intention of the Soviet scientists to build a military base on the Moon in order to threaten from there the United States of America." All they want to do is to "penetrate the secrets of cosmic space." Sure.

All that we can say to Trud is that we hope U. S. scientists still keep reaching for the Moon—and fast! •

RED VERSION of Moon trip includes radio-controlled tankettes, to send TV picture back to Earth, and permanent manned Moon stations.



Первое жилище на Луне — клочок уюта на поверхности этого негостеприимного мира. Внутренняя обстановка его должна удовлетворить основным требованиям: быть легкой, компактной и удобной

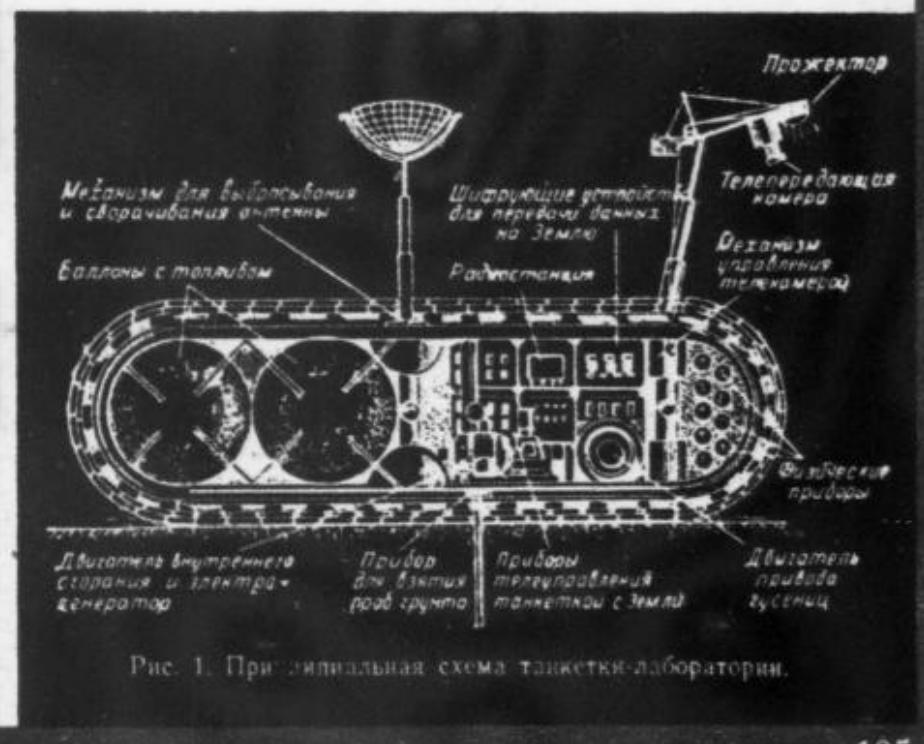


Рис. 1. Принципиальная схема танкетки-лаборатории.

TER

McCAHILL TESTS THE '58 CHEVROLET AND FORD!

MECHANIX ILLUSTRATED

THE HOW-TO-DO MAGAZINE

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AT'S THE SECRET OF THE 7-TON TRUCK THAT HITS WITHOUT HURTING? See Page 75

MOST WANTED XMAS GIFTS FOR SPORTSMEN AND HOBBYISTS

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Cover: Rolligon truck photo courtesy Albee Rolligon Co.
Sleep photo by Curt Gunther
Dirigible painting by Frank Tinsley

DECEMBER 1957

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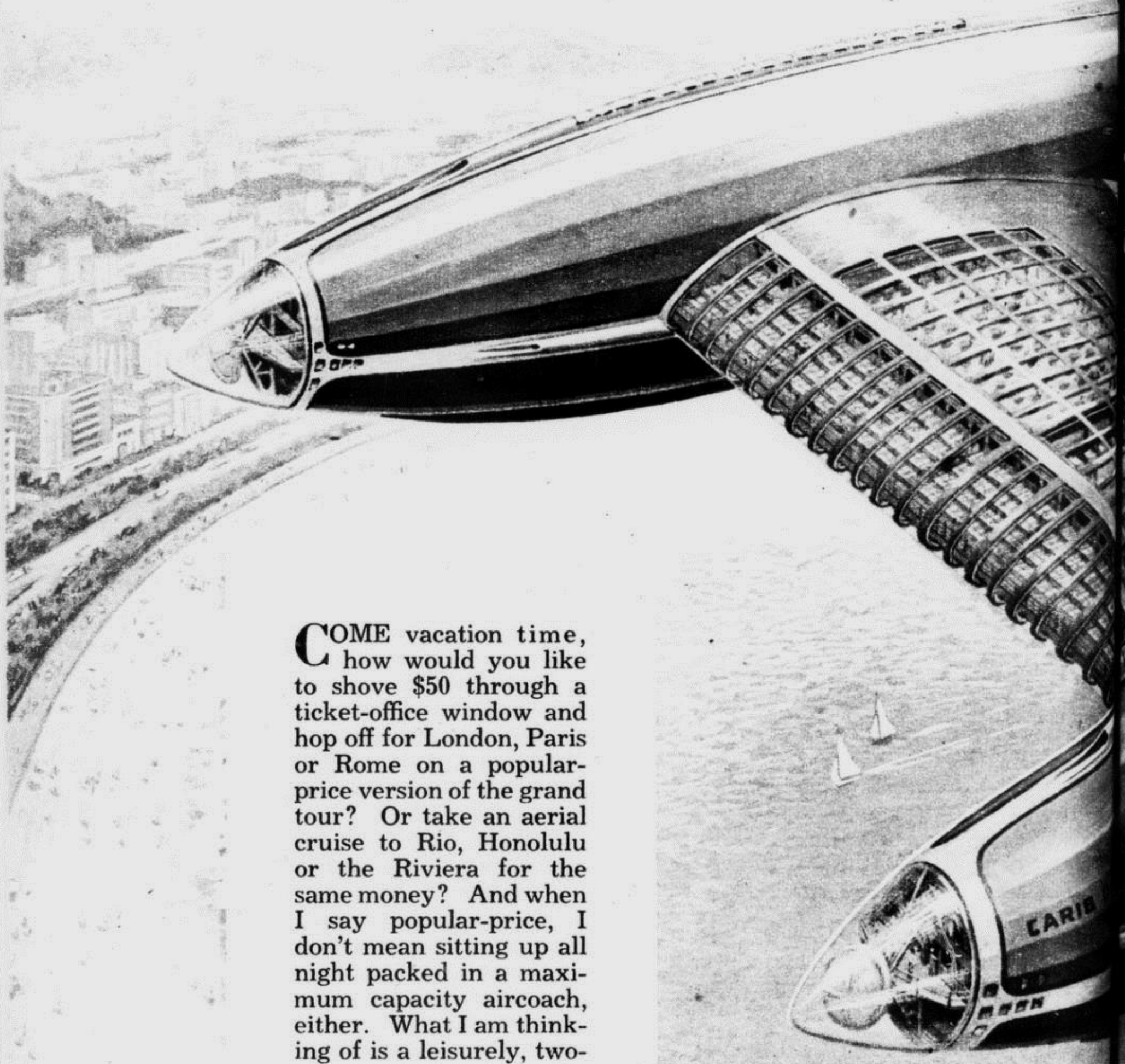
Why Don't We Build...?

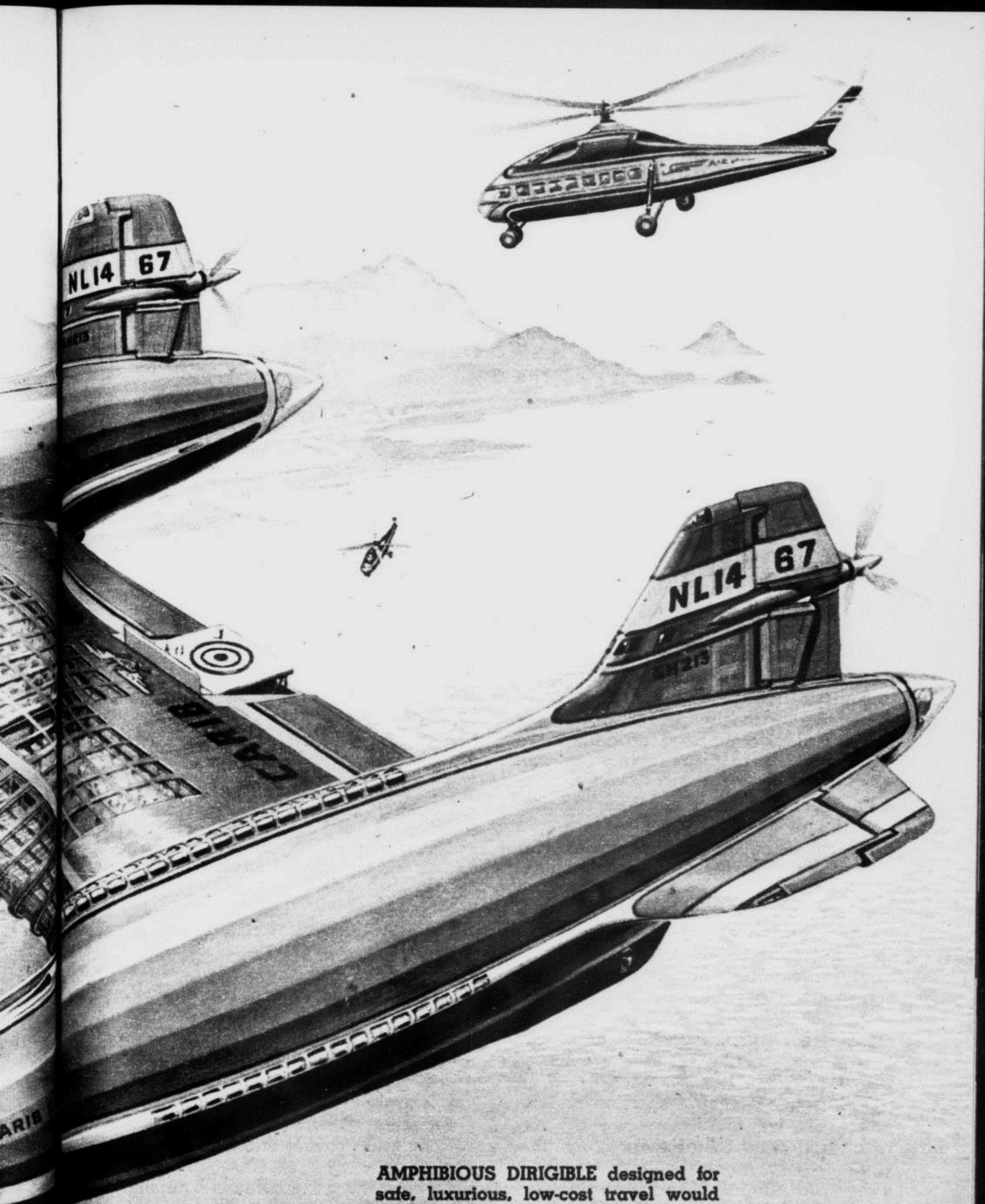
DIRIGIBLE CRUISE SHIPS

Bringing back the airships could mean world-wide vacations for everyone.

By Frank Tinsley



COME vacation time, how would you like to shove $50 through a ticket-office window and hop off for London, Paris or Rome on a popular-price version of the grand tour? Or take an aerial cruise to Rio, Honolulu or the Riviera for the same money? And when I say popular-price, I don't mean sitting up all night packed in a maximum capacity aircoach, either. What I am thinking of is a leisurely, two-



AMPHIBIOUS DIRIGIBLE designed for safe, luxurious, low-cost travel would carry passengers in its four-deck wing.

FRANK TINSLEY '56

MI's versatile dirigible will be able to put down on water or tie up at land-based towers.

day-and-one-night passage in a huge, safe, smooth-sailing airship. Free from noise, vibration, air or seasickness, with a wide choice of meals, plenty of room to move around in and a superb spectators' gallery from which to view the ever-changing panorama of land, sea and sky.

A fleet of such airships could provide not only speedy, transoceanic service but in conjunction with a chain of similarly run resort hotels, could be used for low-cost vacation cruises, conventions, etc. Just visualize the plight of today's average office or industrial worker with a two-week vacation period and limited budget. Most vacations come at the height of the summer season when resorts are jammed and rates at their top levels. Ground travel is comparatively slow and the airways expensive, with the result that either precious days or hard-saved dollars are blown away in just getting to a vacation spot.

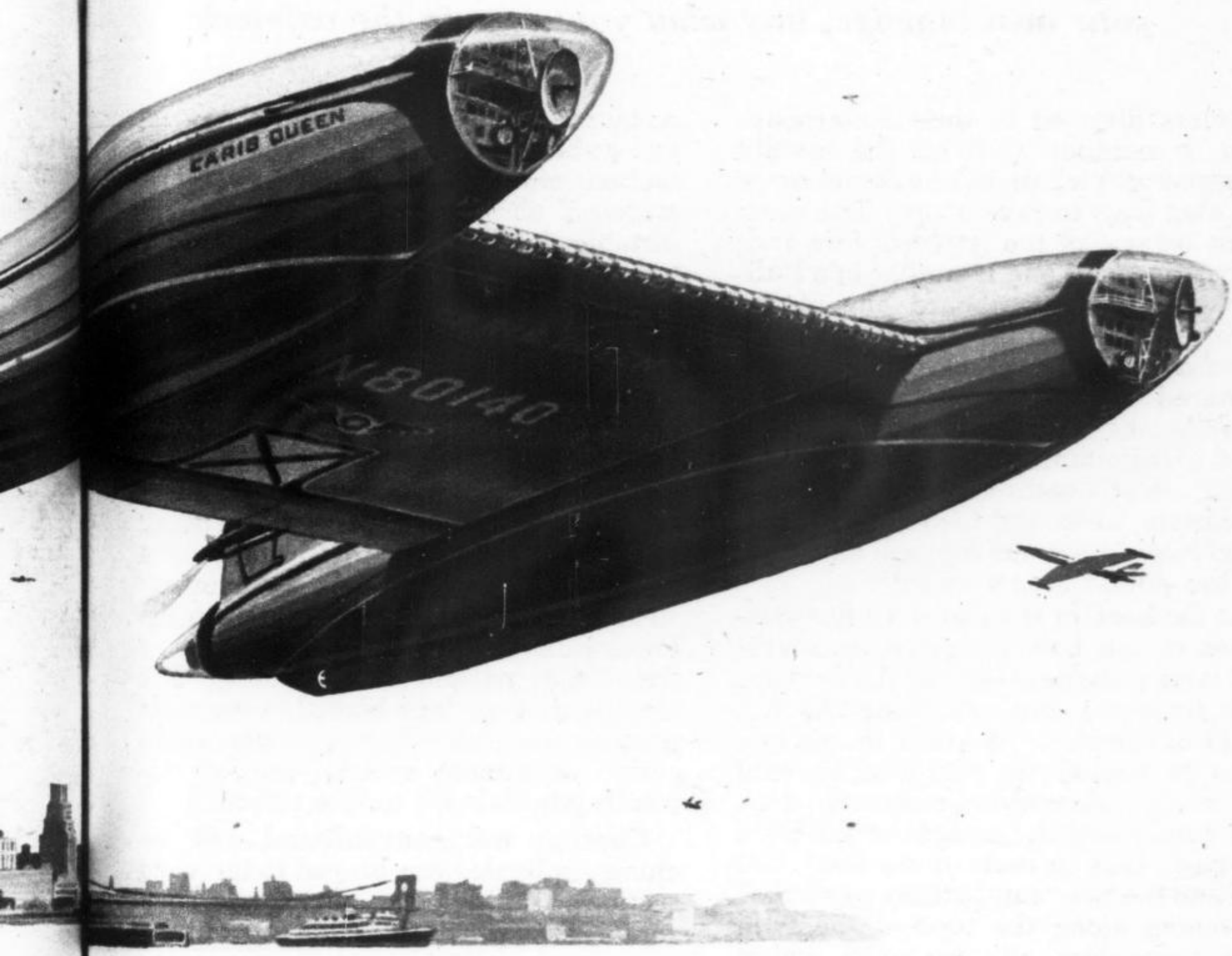
On the other hand, consider the possibilities of an airship cruise, either in the form of an all-expense package or pay-as-you-go. First of all, the hotel comfort, unique sightseeing facilities and cruise ship social life, make the journey an integral part of the vacation, not just a get-there chore. Secondly, the speed of the trip—a nice compromise between the slow steamship and the swifter but prohibitively expensive airplane—permits more days of fun and relaxation at the selected resort.

This space-covering speed brings an entire change of climate within easy reach and makes winter vacations possible for the ordinary pocketbook. Such a set-up would extend the vacation season to the entire year with far less dislocation to the average office or industry. In a dirigible cruising at 100 mph, Hawaii's tropic sands are just 24 hours away from foggy Frisco, giving the winter vacationer 12 full days before bid-

GIANT WING enclosing four decks of

ding the islands *aloha*. The New York clerical worker is within an easy 11 hours of Miami, less than eight of Bermuda and for more ambitious travelers, a 19-hour run of Mexico City or the Virgin Islands!

To meet its stringent safety specifications and provide sufficient space for ample passenger accommodations, MI has come up with a radical departure in airship layout. One of the operating requirements was that the ship be amphibious—capable of either tying up to conventional land-based mooring masts or to buoys anchored in terminal harbors. This necessitated beefing up the



passenger facilities would hold twin envelopes together and provide lift at cruising speeds.

lower portion of the airship hull and making it watertight, a decision that precluded the usual placement of passenger quarters beneath the bag.

The solution to this problem lay in designing our cruise ship in the form of a huge, aerial catamaran with a wing-shaped passenger cabin connecting two 560'x100' rigid dirigible hulls. This husky tranverse structure follows the lines of the Durand-13 high-lift wing section and is mounted at an optimum four-degree angle of attack. With a 245' chord and four decks nested within its 40' thickness, the gargantuan wing lifts its own weight at cruising speeds.

Let's step aboard this aerial giant and see what it looks like to its passengers. The ship lies at its mooring in the protected waters of New York's Long Island Sound, held down by tons of water ballast pumped into its twin keels. Lowered beneath the center of the wing's trailing edge, a retractable landing stage awaits the travelers who arrive by boat from city piers. Two stories above, protruding from the wing's upper surface, is a hinged helicopter landing pad for more affluent voyagers who prefer the faster, whirlybird ferry.

Both entrances lead to a reception salon where tickets are checked and

In this lighter-than-air pleasure palace the extra expenses are lighter, too—you save on tips by carrying your own luggage, buy what you want in the cafeteria.

travelers directed to their staterooms. Ours is number 39-B on the middle deck and we pick up our keys and carry our own bags to save a tip. The room opens off one of the lettered, fore-and-aft passageways and is similar to a Pullman compartment aboard one of the better streamliners. Painted in soft, pastel colors, it is well carpeted and upholstered and is fitted with upper and lower berths, now folded neatly out of sight. Adjoining is a snug, scrupulously clean bathroom containing a washbasin, toilet and tiled shower stall. Quickly we stow our luggage and head for the public rooms above.

At the head of the stairs we find ourselves in the bow gangway, an eight-foot wide passage built into the forward spar structure and extending the full width of the ship. A stroll to one end takes us through the port dirigible hull and along a glassed-in promenade deck that runs down the outside of the rigid gas-bag. Like its mate on the starboard side and the two "sun-bathing pavilions" stretching along the tops of the twin bags, these decks use the space within triangular side and top "keels" that reinforce the huge structure longitudinally.

Back in the wing, doorways lead into the various public rooms. The center section is split into two, huge dining halls. One is a low-cost cafeteria which doubles as a cocktail lounge and snack bar between meal hours. The other is a deluxe restaurant/night club with full service and corresponding prices.

Outboard of the dining rooms are luxuriously furnished lounge/writing rooms with adjoining movie theater, television and music rooms. Like the restaurants, these operate on a pay-as-you-go basis. Extending across the nose section of the huge wing is a glass enclosed observation veranda. Comfortable deck chairs lined up on four terraced levels permit magnificent, unobstructed views of sea and sky.

Structurally, the dirigible components of the new cruise ship are almost identical with MI's Atoms-For-Peace airship (March 1956), with the addition of a tremendously strong, X-braced connecting wing which extends right through the gasbags. The powerplant, too, is similar, except that in place of a single atomic installation, twin atom/steam/electro units are mounted in the lower hulls of the dirigibles, well away from the passenger quarters. The electric-driven, four-bladed, reversible propellers—most efficient power application at airship speeds—are contra-rotating to balance torque effects.

Controls are conventional and include a split elevator hinged to the wing section's trailing edge, plus single horizontal fins which function as outsize trim tabs. With widely separated screws and rudders, our cruise ship should turn in her own length and her almost square planform gives her enormous stability. Small props and rudders are provided for water maneuvering.

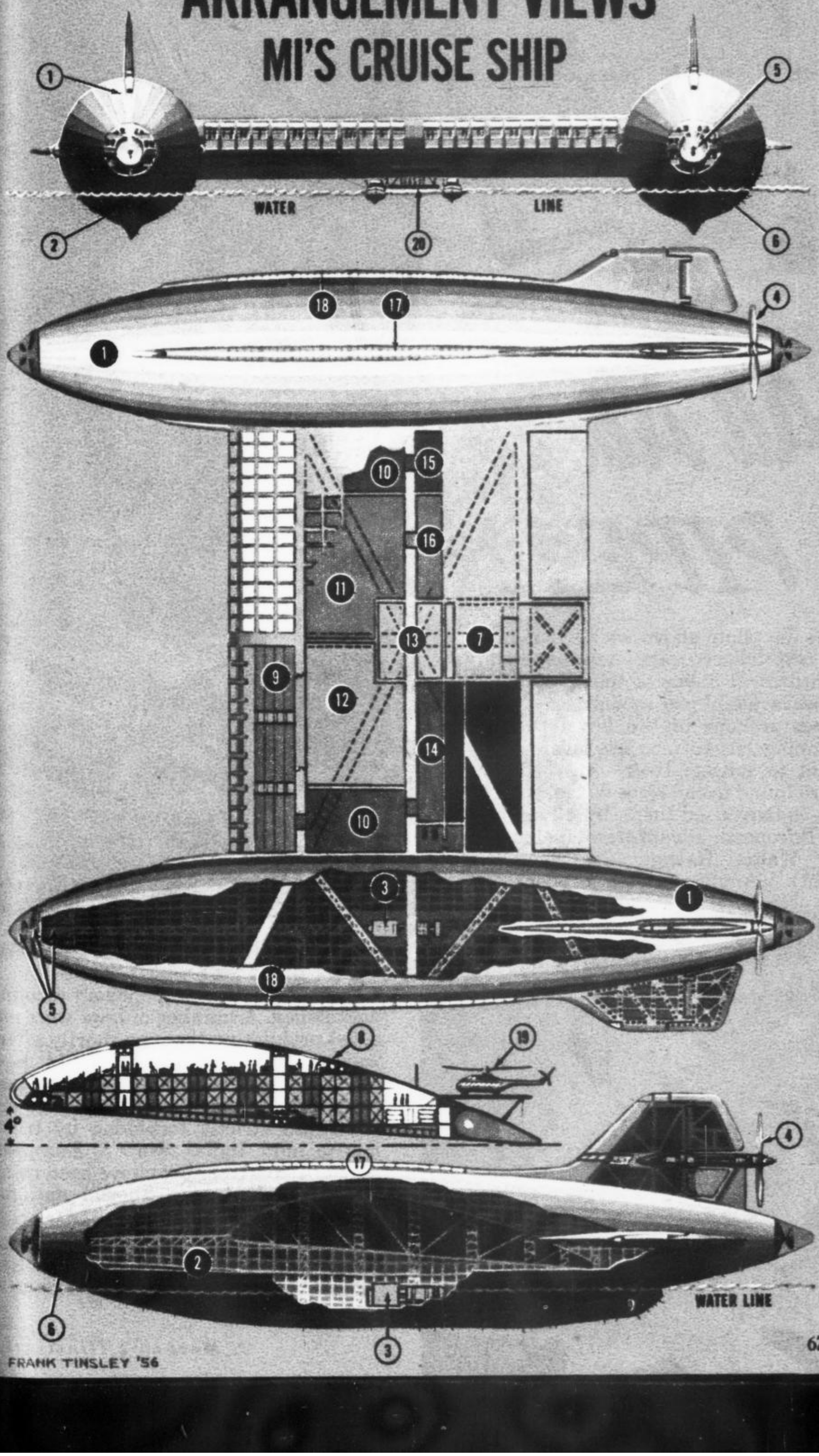
Here, then, is MI's answer to the problem of an efficient, mass transportation vehicle. It is commodious, fast enough to evade storms and can travel anywhere on earth. Inflated with fireproof helium and equipped with the latest flight instruments and communications gear, it should prove to be man's safest and most comfortable and reasonable means of vacation travel. •

KEY

1. INFLATED HULL; 2. Boat hull; 3. Atomic plant; 4. Props; 5. Bridges, radar, crew; 6. Mooring gear; 7. Passenger wing; 8. X-section of wing; 9. Observation deck; 10. Lounges; 11. Cafeteria; 12. Dining room; 13. Kitchen; 14. Movies; 15. Music room; 16. TV room; 17. Sun decks; 18. Passenger promenades; 19. Helicopter landing pad; 20. Boat landing.

ARRANGEMENT VIEWS

MI'S CRUISE SHIP



FRANK TINSLEY '56

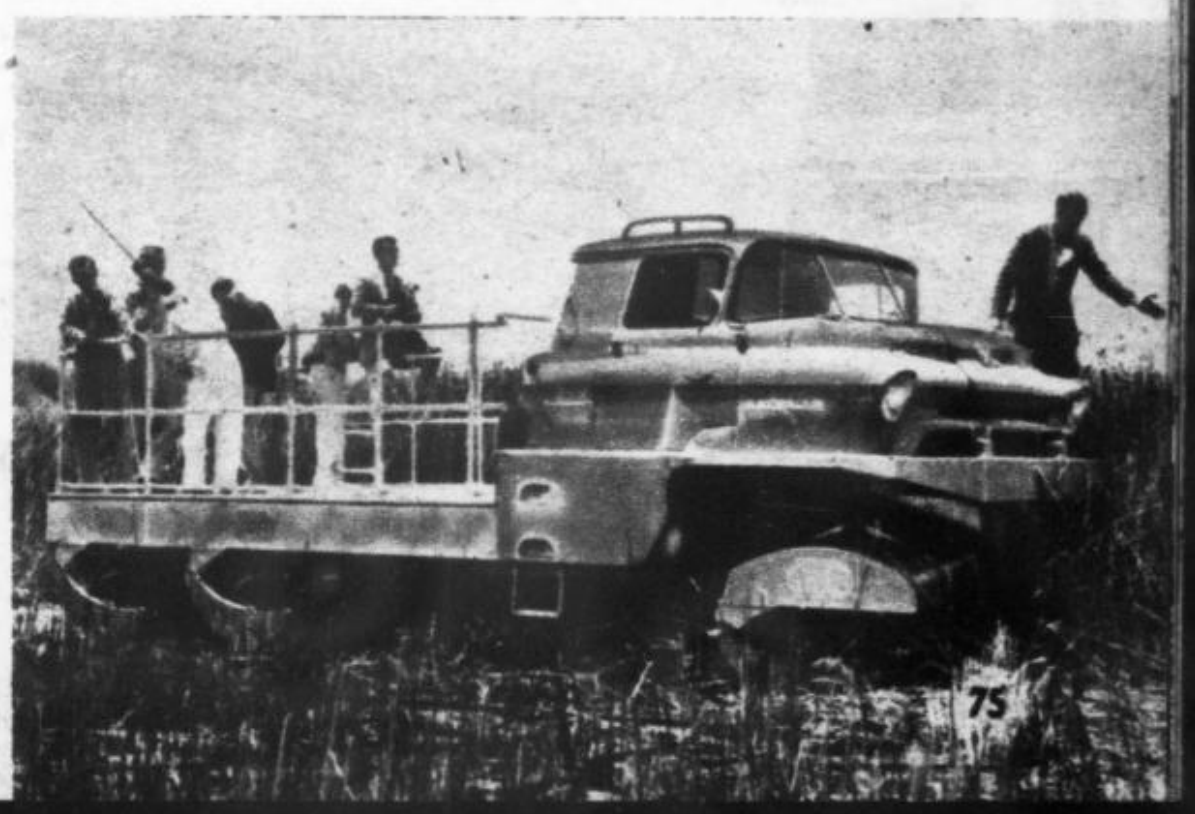
COVER STORY

PILLOW-WHEEL TRUCK GOES ANYWHERE

DAREDEVIL DRIVING is a lead pipe cinch on these limp blimp rollers.

IN the February 1957 issue of MI we presented Frank Tinsley's notion of a great travel experience of the future—a trip in a land ship that would traverse tundra, bog and desert with equal ease. Here is a new version of the go-anywhere buggy that is now in actual operation. Like the Tinsley wagon, this will run over your back without squashing you. What is the secret of the wonderful Rolligon? It all goes back to the Eskimos. Ages ago they solved the problem of hauling

SWAMP where gnats sink to their knee-caps is smooth as a turnpike to a Rolligon.



PUDGY ROLLERS spread seven-ton truck weight out to two pounds per square inch.

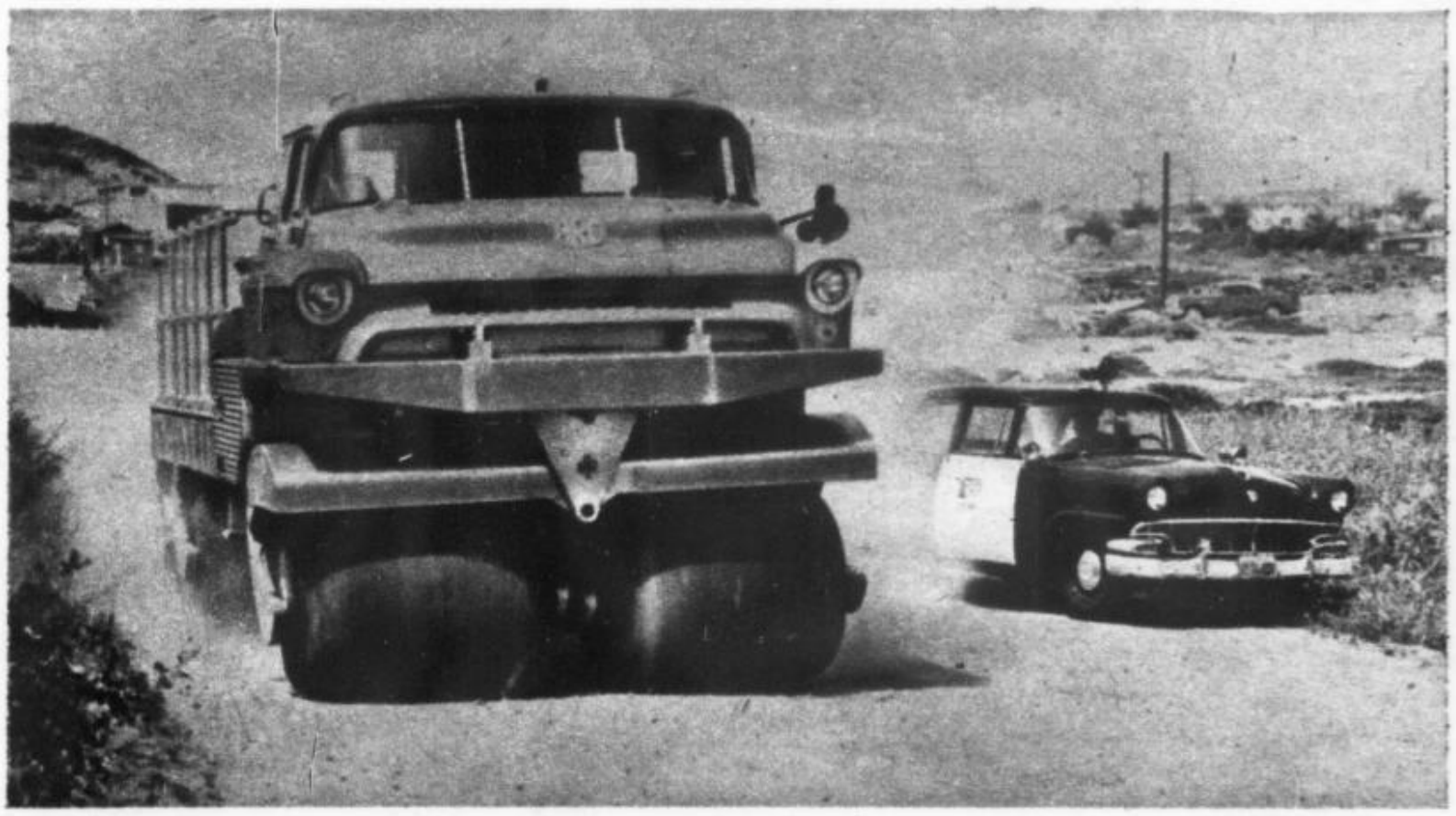
POLE CLIMBING truck goes like a lynx up smooth logs at a 70 per cent incline.

Squidging along on its saggy airbags over all kinds of ground, Rolligon makes off-road history.

immense weights over unpaved terrain: big walrus hide bags partly filled with air. Back in 1951 an old Arctic hand named Bill Albee began figuring out a way to use similar airbags instead of wheels in a powered vehicle. The answer to this problem is embodied in the present Rolligon vehicle being made by the Albee Rolligon Company of Monterey, Calif. In the closeup of the roller on the opposite page you will see another smaller roller on top of the big one. The little roller is transmitting drive to the supporting one. In wheeled power vehicles weight and drive are transferred to the axle rather than to the top of the wheel. For working out the principle of top drive and top loading, Albee deserves at least as much credit as the Eskimo who invented the airbag. •

GREAT BIG STONES break no bones, make no obstacles for Rolligon's airbags.

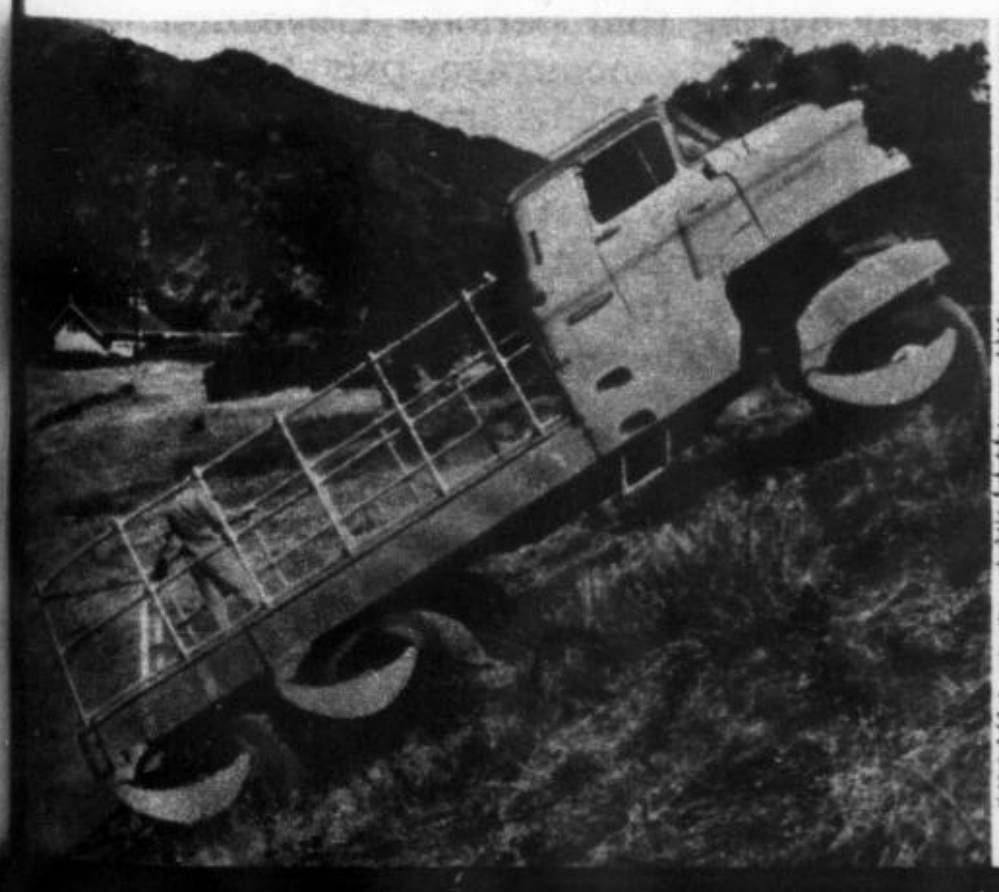
WADING and floating are easy. Spinning bags only partly propel it when floating.



SPEEDING through radar trap at 41.6 mph top speed during hard surface test.

HILL CLIMB: she'll take an 82 per cent grade through weeds, 60 per cent on sand.

MOUNTING vehicle on rollers and supplying drive to them were the tough jobs.



Cross-Country YACHT

TRAVELINER can carry up to six passengers with complete living-in facilities on road.

MI's Highway Cruise Car, the July Cover story suggesting a luxurious, coast-to-coast family vehicle for our super highways, brought in a flood of mail and the not too surprising fact that a similar vehicle already exists.

All the luxuries of home are provided in the imaginative Traveliner built by Dwight Austin of Kent, Ohio. These include sleeping accommodations for six, toilet and shower facilities, reclining chairs, kitchen and practically everything else you'd like to see in a home on wheels. Austin, the Traveliner's designer, and his wife have road-tested the cruise car over "9,000 miles in all kinds of weather." Result? "Extremely satisfactory." •

RAILROAD-TYPE cabin seats recline, can be raised, lowered, face rear for rest stops.

LOUNGE also has reclining seats. Traveliner has kitchen, shower, toilet facilities.

FERENCE
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MECHANIX ILLUSTRATED

THE HOW-TO-DO MAGAZINE

BUILD THIS PLANE FOR UNDER $800 INCLUDING ENGINE! Plans, Photos, Drawings

25c
MAY

SPECIAL SECTION!

Everything to Know About

ARETIME PROSPECTING

Uranium and Precious Minerals

nventor's Miracle Car May
evolutionize Auto Industry

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VOLUME 51, NUMBER 5

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IBM MEANS

"I BRING MASSACRE"

Roaring at 10,000 mph, this Intercontinental Ballistics Missile can destroy a city half a world away in less than one hour's time.

By Martin Caidin

C-1.

Remember that designation. It's the code name of the world's most fantastic rocket weapon—a hypersonic glider capable of crossing an ocean at speeds up to 10,000 miles per hour!

More than ten years ago the Ordnance Department of the U. S. Army launched with the General Electric Company a new rocket research program dubbed Project Hermes, which has expanded into what is probably the world's

Piloted, the IBM is more than a weapon—it is the prototype of

greatest single concentrated attack on the myriad problems of rockets and guided missiles.

From Hermes' laboratory and field activities there have emerged new and powerful rocket motors of all sizes and shapes. Dangerous fuel combinations have been tamed and used on an operational scale. Hermes' scientists conducted the launching of a V-2 rocket from the deck of the U.S.S. *Midway*, then exploded in Operation Pushover another V-2 under the same conditions. Hermes' engineers handled all but one of the 68 V-2 rocket firings in this country. They shattered all rocket performance records when they sent a V-2 with a WAC Corporal thundering 252 miles above the earth at a speed of more than 5,000 miles per hour!

The G. E. scientific staffs amassed a tremendous backlog of data on missile development and firing. Now the most dazzling of all the Hermes' endeavors has come to light in the C-1.

C-1 is, simply, a design for a three-stage Intercontinental Ballistics Missile whose final step is a hypersonic glider with a range of thousands of miles.

Actually, the first physical stages of the C-1's development began more than five years ago in the test firing series known as Operation Bumper. This program, which involved the launching of two-stage rockets to unprecedented heights and speeds, created serious problems which at first baffled even Hermes' battery of engineers. To lick the problems they teamed up with scientists of the California Institute of Technology and the Douglas Aircraft Company.

The problems of launching successfully a two-state liquid-fueled rocket had never before been encountered in practice. The first four launchings of a V-2, carrying in its nose a slim WAC Corporal missile, were "successful failures." They indicated clearly to the General Electric engineers why the rockets misfired and disintegrated.

The Hermes staff then learned what had never before been known—how to start a rocket motor at heights exceeding 100,000 feet! At that altitude, where the WAC Corporal motor was to burst into flaming life, the fuel and the oxidizing agent in the Corporal was more prone to vaporize and explode with terrible force, than to burn normally.

What the G. E. engineers learned is secret. But Bumper No. Five soared 252 miles and reached 5,100 miles per hour. Bumper Nos. Six, Seven and Eight were experimental shots which tested in practice the horizontal flight separation of rockets at speeds of 3,000 miles per hour.

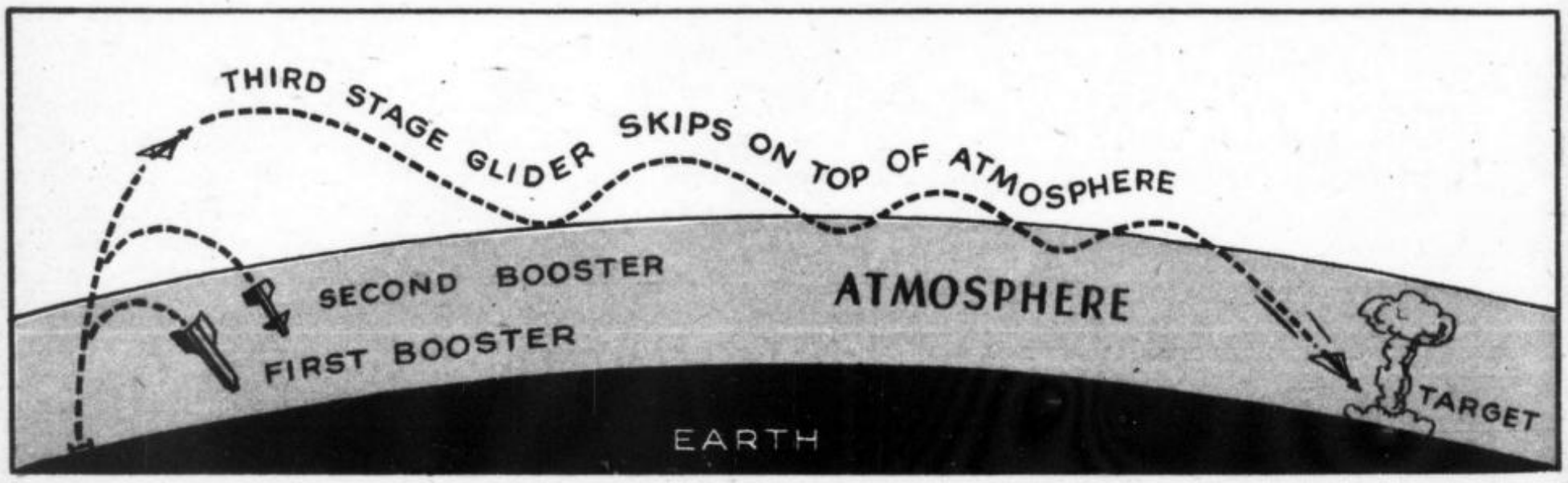
These latter experiments were the key to the successful testing of what will probably be the world's first Intercontinental Ballistics Missile—the C-1 hypersonic glider.

C-1 is a three-stage rocket; i.e., a missile of three separate parts, or stages. The first stage, also described as a first booster, will lift the ponderous weight of the intermediate stage (or second booster) and the hypersonic glider beyond the atmosphere and endow it with a speed of several thousand miles per hour.

High above the earth, already tilting from the vertical flight of the takeoff toward the curving horizon, the second stage motors will roar into life when the first booster's fuel tanks are empty. Then the empty first booster will be jettisoned. Already moving at many thousands of miles per hour, the second stage will send the glider higher into the atmosphere, adding to its constantly increasing velocity.

Finally, with both boosters falling back

Moving at thousands of miles per hour, the hypersonic glider "bounces upward," streaking across the top of the atmosphere until it hurtles into its objective at just above supersonic speed.



the world's first spaceship!

to earth, the motors of the third-stage glider begin to operate. More speed! And within soundless seconds the brilliant flames of the rocket motors give the glider a maximum speed of from 8,000 to 10,000 miles per hour!

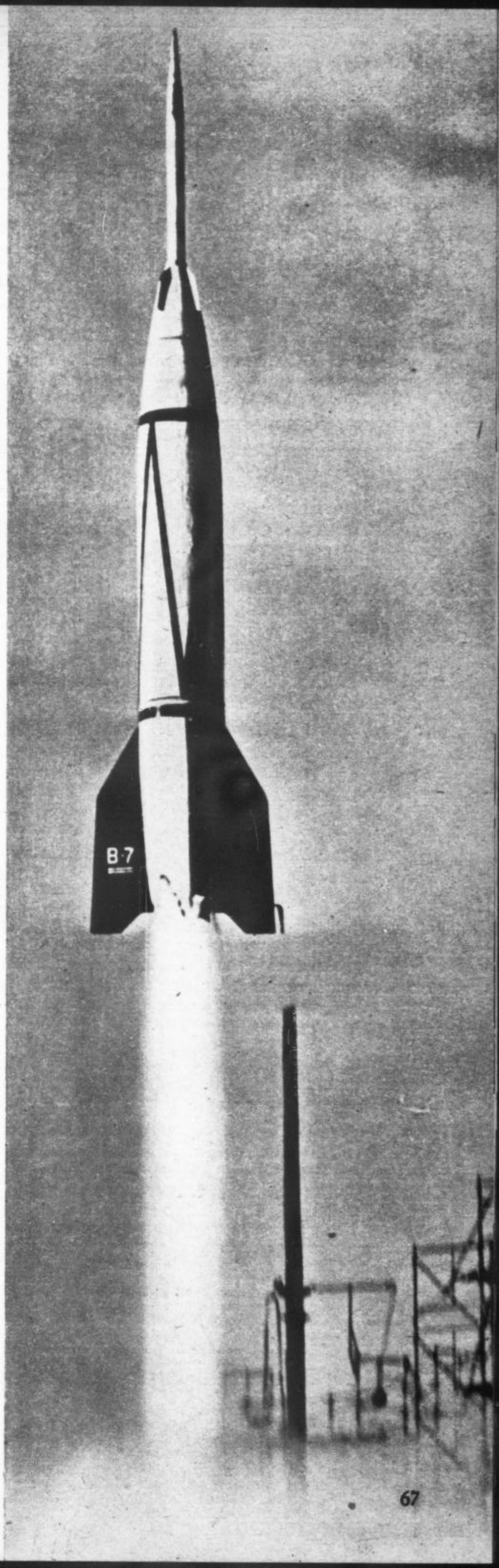
The hypersonic glider, once its fuel is exhausted, continues to whip over the globe in a great, shallow curve. Finally, even the fantastic velocity of the glider succumbs to gravity and begins to diminish. The glider then starts its reluctant return to the atmosphere. But it is fitted with gracefully curving delta wings, and as the wings bite into the rarified gases of the lower stratosphere, the tremendous speed of the glider imparts great lifting force to these wings.

Miraculously, the glider, moving at thousands of miles per hour, "bounces" upward! Again the glider soars in its great shallow curve. Again the forward velocity drops, and the glider slides on its invisible curve to the waiting atmosphere. Silently, in the bitter cold of the upper atmosphere, the wings "grip" the air, heat up furiously and send the glider soaring upward.

The hypersonic glider, in effect, hurtles across the top of the atmosphere like some fantastic stone hurled by a giant across a pond. It skips across the earth on the tenuous matter of rarified gas! Each time the glider descends into the air, the friction of its passage through that air reduces the forward speed. Finally, nearing its destination, which is an enemy target halfway across the globe, the glider is down to just above supersonic speed when it hurtles into its objective.

This is no pipe-dream project. This is the C-1 of Project Hermes. This is the far future come true!

The C-1 project actually began many months before Hermes even existed. If any weapons project of World War II could truly be tagged with the word "fantastic," then it was the German rocket program at Peenemunde. Under the direction of Major-General Walter Dornberger, German scientists not only produced the well-known V-2 and other rockets but commenced the first of what they planned as a series of tests to produce an intercontinental missile—a [*Continued on page* 200]



Two-stage bumper rocket leaps skyward at one of the Army Ordnance's long-range proving grounds.

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THE BEEPS of satellites from outer space, exciting calls from ships and planes, informal chit-chat of radio hams: these and a hundred other delights can be yours by the magic of SWL—short-wave listening. It doesn't take a fortune or an electronics degree to get started. You can find out about sets, prices and exactly how SWL works in Tune In On The World in the Feature Section of this issue of MI. In the Home-Crafts-Shop Section you'll learn to assemble a receiver kit—your ear for the wonders of SWL.

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NOVEMBER, 1960

Volume 56, Number 11

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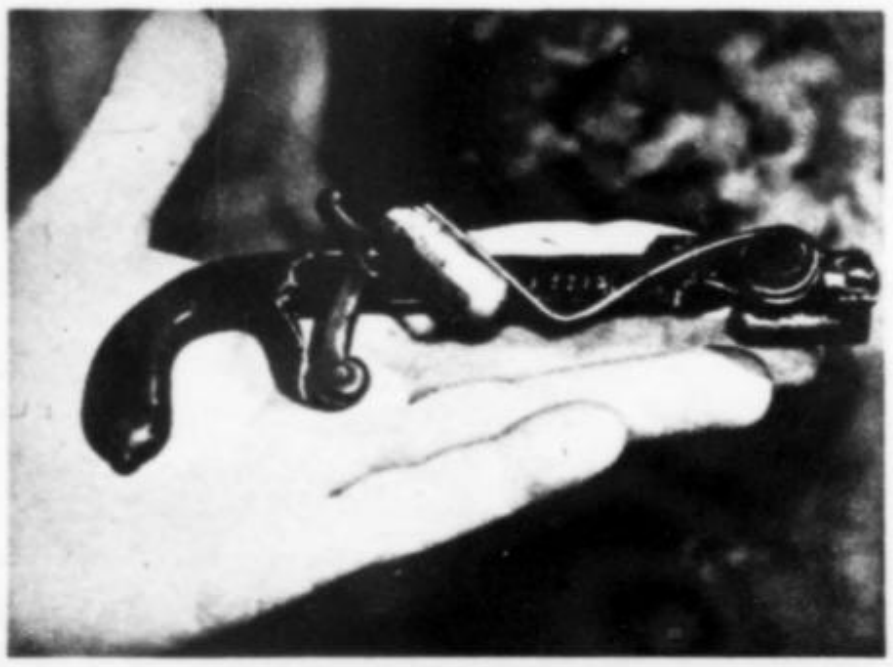
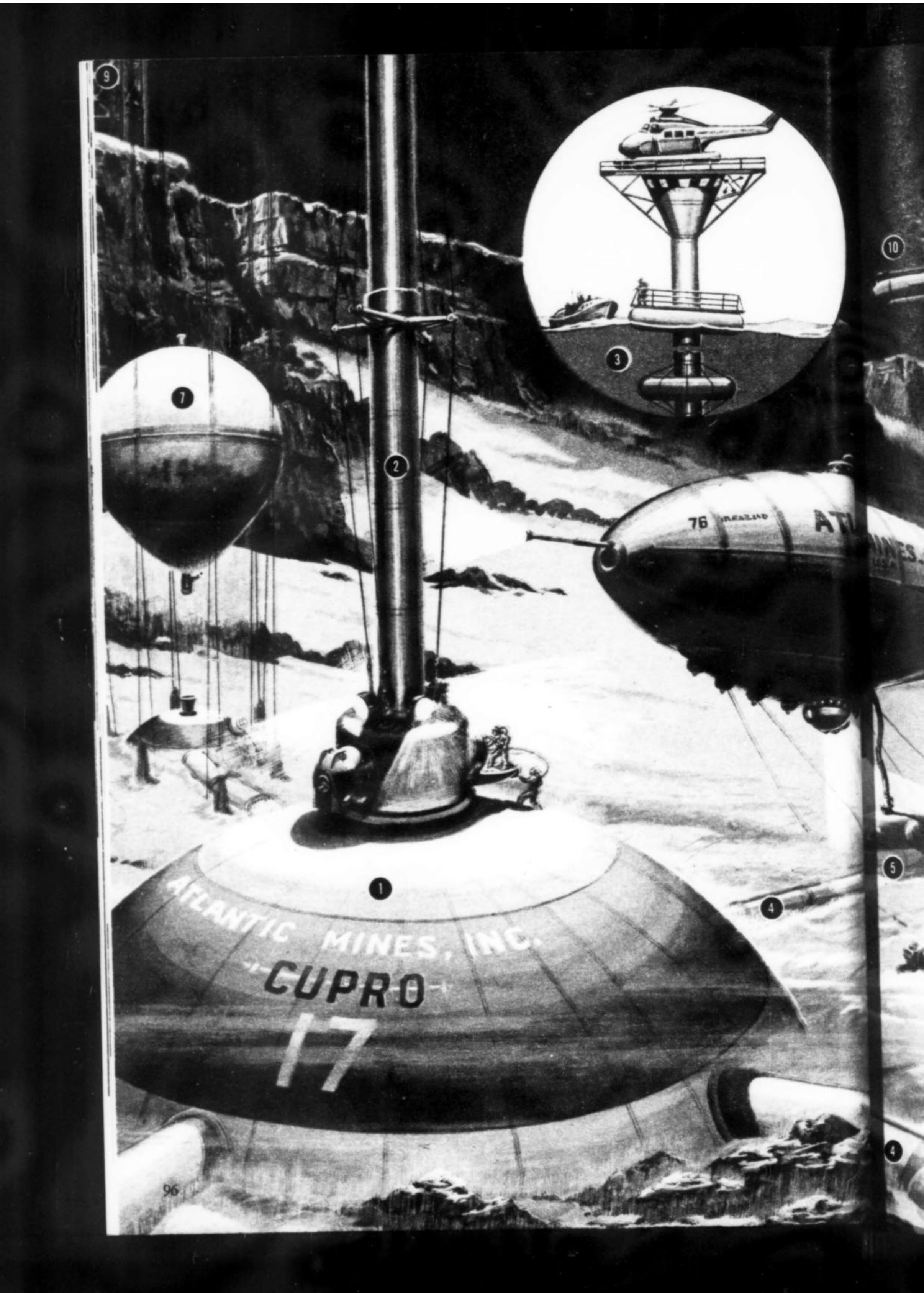
DOUBLE DUTY outboard-powered trailer-boat has only to let down those wheels and hitch up to a car to become a licensed highway vehicle. Note bow coupling.



WHATSIT projectile hurler is a puzzle to antique weapons men. Is it a gun, a toy, a tool, what? What did it throw? Gadget was patented in November, 1862.

BIG WHEEL in Vancouver, British Columbia, is this remarkable wheels-within-wheels vehicle. The 100-incher was devised by Bert Hobbis of Westminster, B.C.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LET'S MINE THE WORLD'S UNDERWATER WEALTH!

By Frank Tinsley

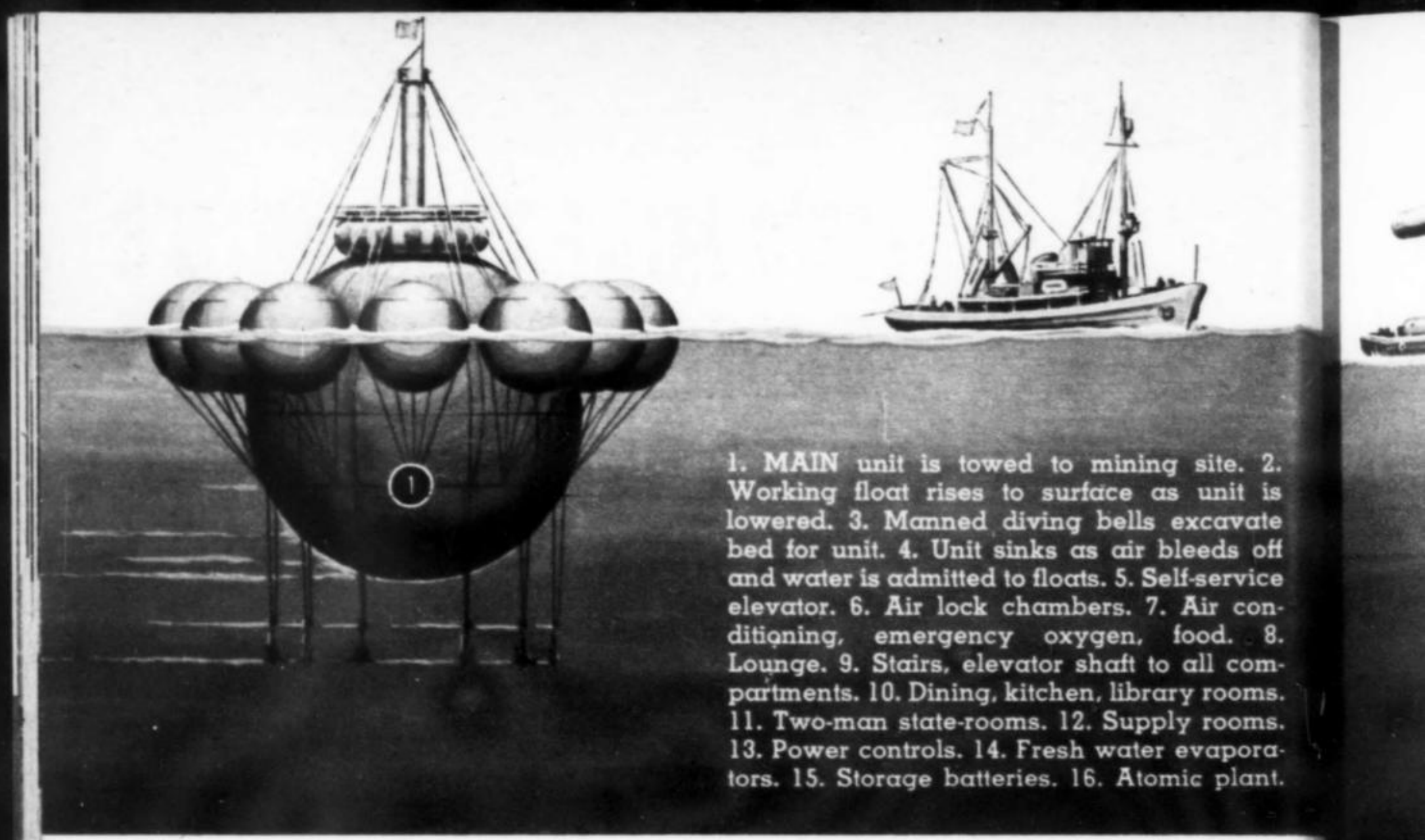
NOW is the time to mine the wealth that lies beneath the sea, claim our oceanic experts. Already we farm shallow sectors of the sea for edible vegetation, pump oil from offshore wells and mine beneath coastal waters for coal and minerals. Since two-thirds of the globe is covered with water, scientists believe that two-thirds of the world's natural resources are still untapped.

The problems of constructing underwater vehicles have already been solved. In January of this year the U. S. Navy bathyscaph *Trieste* descended almost seven miles in the Pacific Ocean with two men aboard. Another useful sub-surface craft is the newly developed RUM (Remote Underwater Manipulator), a sea-bottom crawler with a 15-foot arm capable of doing mechanical work at depths up to 2,000 feet.

The illustrations in this article depict an underwater copper mining station and MI's proposed plan for building it. Ore bearing areas are first located by cruising bathyscaphs with magnetic metal detectors. The bathyscaph is propelled by the Zwicky chemical jet system which admits sea water through an intake in the bow, adds a spontaneously reacting chemical that expands the water into a burst of high pressure

DIAGRAM of underwater mining operation: 1. Base and living quarters. 2. Airshaft to surface is buoyed at intervals by subsurface floats and kept rigid by rigging cables. Tube contains self-service elevator. 3. Surface end of shaft has accommodations for boats, helicopter. 4. Subways leading to mine shafts. 5. Mine shafts. Ore collecting chambers are above sea floor. 6. Bathyscaph powered by chemical jet engine carries ore in perforated cargo hold in its belly. Ground-up ore is mixed with sea water and "slurry" is pumped up through hose into hold. Bathyscaph takes ore cargo to shore base. 7. Bathyscaph-type elevator is another method of getting ore to surface ship. It travels up and down shaft of anchored cables. 8. Remote-controlled crawler attaches and detaches hoses with arms. 9. Legs of underwater oil well. 10. Reynolds Aluminum Co.'s design for deep-diving exploration submarine. 11. Drill of Project MOHO being lowered for drilling into center of earth.

FRANK TINSLEY '6



1. **MAIN** unit is towed to mining site. 2. Working float rises to surface as unit is lowered. 3. Manned diving bells excavate bed for unit. 4. Unit sinks as air bleeds off and water is admitted to floats. 5. Self-service elevator. 6. Air lock chambers. 7. Air conditioning, emergency oxygen, food. 8. Lounge. 9. Stairs, elevator shaft to all compartments. 10. Dining, kitchen, library rooms. 11. Two-man state-rooms. 12. Supply rooms. 13. Power controls. 14. Fresh water evaporators. 15. Storage batteries. 16. Atomic plant.

hydrogen-steam, and vents the blast rearward by jet nozzle. Dirigible type rudder and flippers, powerful lights and a horizontal TV periscope assist in subsurface navigation.

Once located by the bathyscaph, the undersea ore site is prospected in detail by RUM-type crawlers. Shaft locations are pinpointed and a central site excavated for the headquarters/living unit. Manned, mechanized diving-bells do the excavating. Carrying three man crews, these pressure-resistant chambers are fitted with tool manipulating arms capable of drilling, blasting, earth moving, etc.

These labor saving diving-bells are suspended from special bathyscaph balloons, anchored well below the surface. Drawing in air from ducts to the surface, these submarine service stations compress it, generate electricity and feed all necessary power and facilities to the working bells below. The latter can operate at cable's end or can be lowered to the seabed. Here, they rest on ball-footed, self-leveling, tripod legs. An air-lock, built into the top of each bell, not only serves as an access hatch on the surface, but permits entrance and egress to divers at various depths.

While the mine site is in preparation, the headquarters/living unit is built in a drydock ashore. Globular in shape, 96 feet in diameter and with insulated walls calculated to sustain pressure at the selected depth, this undersea station contains an atomic power plant, supply holds and living accommodations.

With the mine site prepared and the headquarters unit completed, the big watertight globe is fitted with a girdle of spherical floats. These, combined with considerable displacement of the unit itself, are ample for surface flotation.

With the central headquarters unit installed, smaller units are placed over mine shaft locations and connecting tunnels lowered into place. Beneath the rocky bottom, shafts can then be sunk and lateral drifts bored in conventional fashion. In operation, the ore is brought to the shafthead, ground to soluble size and blown into a mixing chamber atop the shaft unit. Water is then admitted and the resulting slurry is pumped into cargo bathyscaphs for transport to shore plants.

With man's metallic supplies dwindling on land, cost will not be the governing factor. What is important is the opening of vast new underwater reserves of food chemicals and metals for the world's growing population. •

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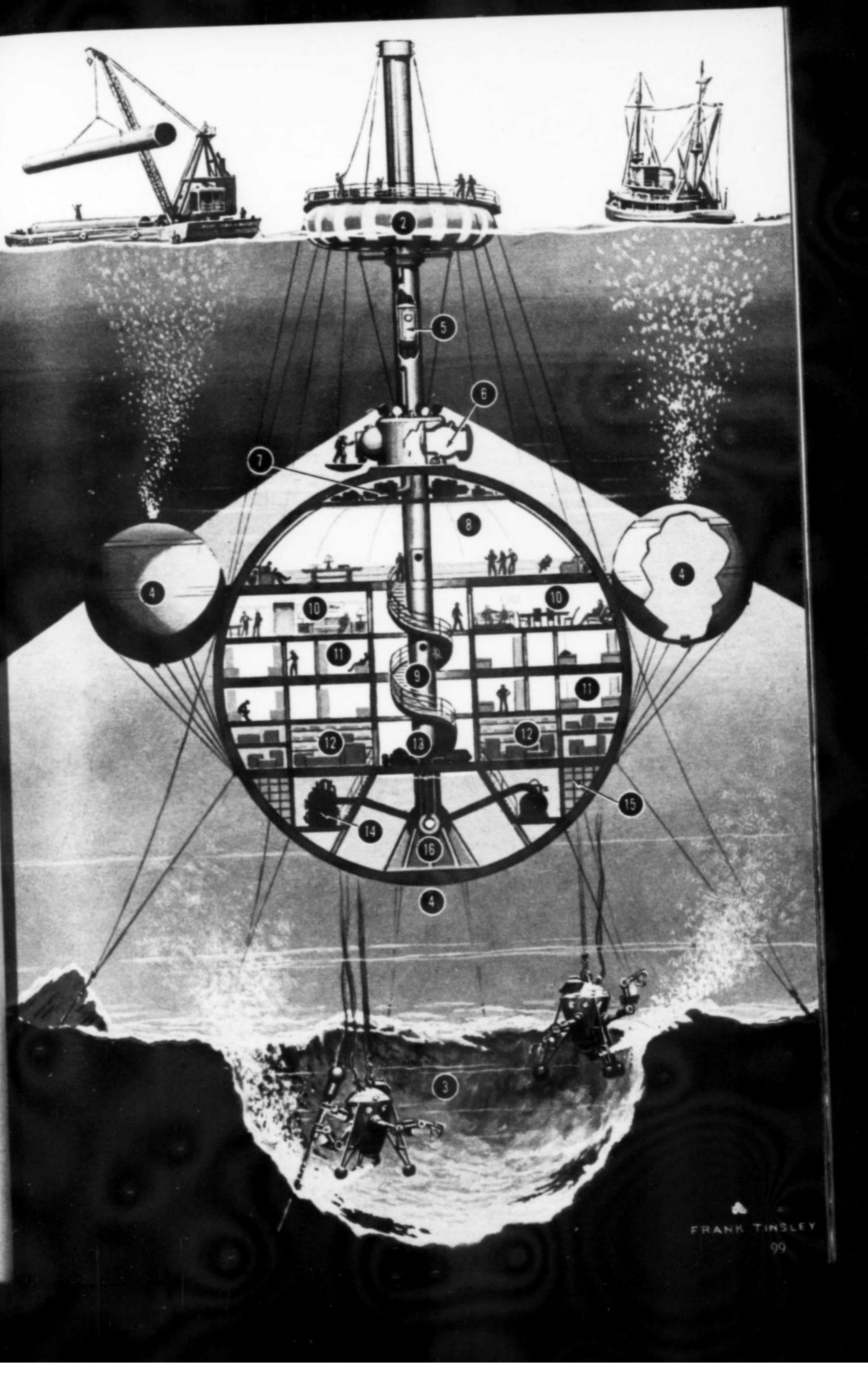

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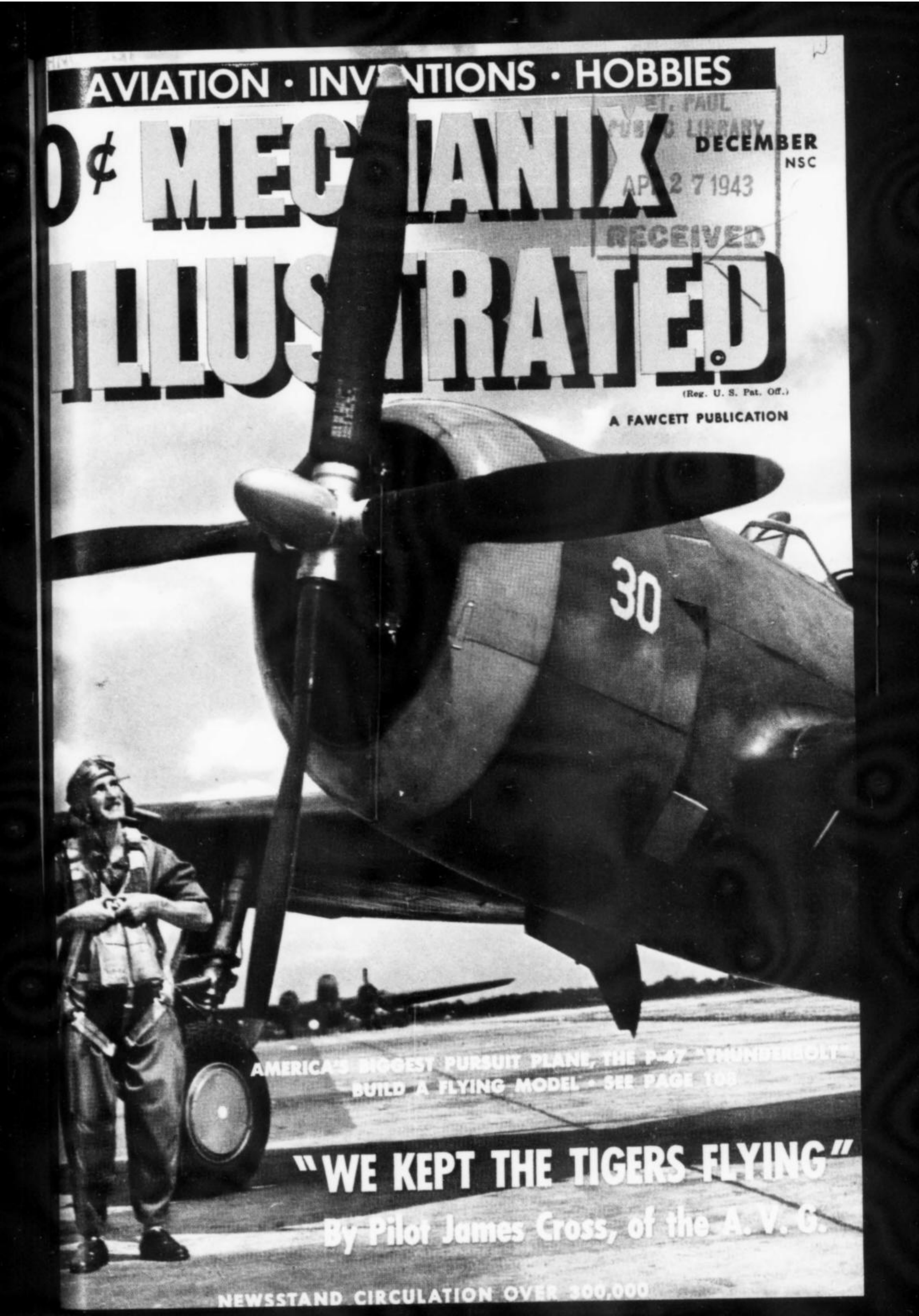

AMERICA'S BIGGEST PURSUIT PLANE, THE P-47 "THUNDERBOLT"

BUILD A FLYING MODEL • SEE PAGE 108

"WE KEPT THE TIGERS FLYING"

By Pilot James Cross, of the A. V. G.

NEWSSTAND CIRCULATION OVER 300,000

DECEMBER 1942

MECHANIX ILLUSTRATED

VOL. XXIX NO. 2

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SPECIAL FEATURES

On the cover: The United States' biggest pursuit plane, the Army's P-47, made by Republic. Boasting speed better than 400 m.p.h. from its 2,000-h.p. engine, it's literally a "Thunderbolt" to blast the Axis. Rudy Arnold kodachrome.

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NEXT MONTH

Could you be an airplane pilot? How is your sense of balance? How steady are your nerves? How is your apparatus of "sense motion"? Can you pass the eye accommodation test? How could you stand high altitude? MECHANIX ILLUSTRATED will tell you exactly how to test yourself in the same manner that all candidates for the Army Air Force are tested, in an intriguing picture story in the January issue. These are tests that anyone can make as part of an interesting parlor game, without special equipment. Be sure to read it and take the tests!

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100-M.P.H. STEAM TORPEDO BOAT

An interview with F. M. Bellanca, noted Airplane Designer,

by George Daniels

THE fastest and most destructive torpedo boat in the world has just passed the design testing stage, and is now being readied for mass production. Born in the mind of one of America's world famous airplane designers, F. M. Bellanca, this sensational warcraft is amazing even to men who know the bloody toll our torpedo boats have already taken of the enemy.

But to Designer Bellanca it is more than just a mighty war weapon—it is the victory contribution of a man who, as Chairman of the

Anti-Fascist Alliance, was fighting the fascist dictators 10 years before most of us even knew they existed. He saw the Armageddon coming, and he had his answer ready—a 100-mile-an-hour fleet smasher with a range of 8,000 miles. Built like a monstrous pontoon seaplane—but without wings, it will carry its engine and crew in a center nacelle, and its fuel and torpedoes in the pontoons!

Giant three-bladed contra-rotating airplane propellers at the tail of the center nacelle will drive the boat. Six .50 caliber machine guns and a 2-inch cannon provide the armament in addition to the torpedoes. And should an airplane venture an attack, it would encounter as elusive a foe as any pursuit ship. For this amazing boat will be able to race its engine up to thousands of revolutions per minute to reach more than 100 miles an hour—then within a matter of seconds, stop the engine completely, and reverse it!

"We can leave our Pacific coastal ports in boats of this type, and within 48 hours blast ships in the harbors of Japan," Mr. Bellanca told me, "and attacks on Germany and Italy from our Atlantic bases would be even simpler."

But the tremendous range and speed of the hydroplane torpedo boat are primarily intended to make it a sort of seagoing sniper, to harry and destroy both naval and commercial vessels of the enemy.

It is designed to float in less than three feet of water; to lurk in shoal waters and hidden coves, awaiting an opportunity to strike. And when its victim puts in an appearance this super-speed warrior can hurl itself from a dead standstill to nearly two miles a minute in less time than it takes a battlewagon to weigh anchor. With throttles wide open, the hydroplane-torpedo boat rises to its running water line, and draws only 19 inches of water!

Incredible as it seems to the layman, the powerplant that will perform this marine magic is practically silent in operation. Known as the *Warren Engine* (after its inventor, Woodruff Warren) this amazing powerplant has undergone several years of closely guarded testing aboard a laboratory yacht, but has never before been revealed to the general public.

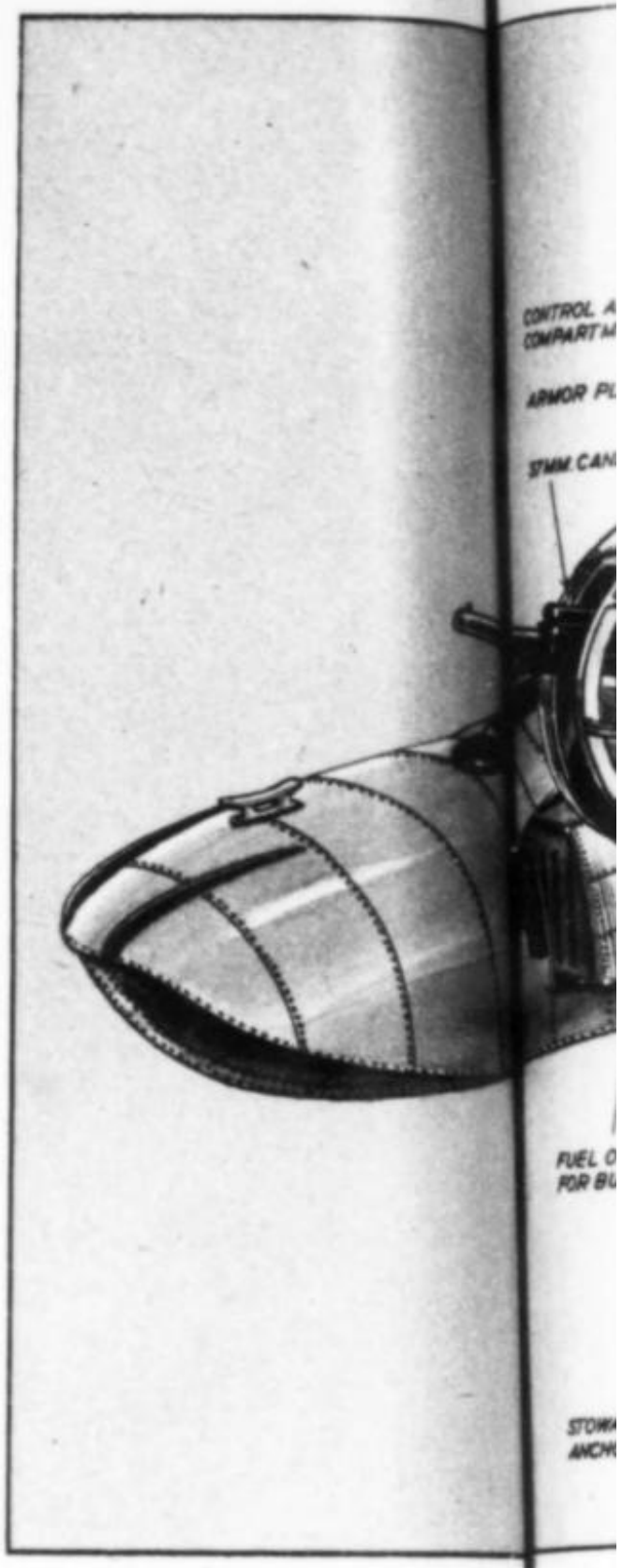
Driven by steam, this engine is 10 to 30 percent more efficient than a turbine, yet less complex than an ordinary automobile motor. An early model, scarcely larger than a juke box, startled power experts by driving the 100-foot yacht at 10 knots with ease.

The steam is flashed from a boiler of the type which the Nazis craftily seized from the late Lieutenant Commander Walter Douglas LaMont, famous American naval inventor—to power their battleships of the *Scharnhorst* class. Boilers of this type, though only half the size of conventional units, are far more efficient.

The Japanese, too, were quick to recognize the value of LaMont's invention. They lost no time in applying it to their navy—although they probably feel some loss of face, in admitting that an Annapolis man could invent a better boiler than they could.

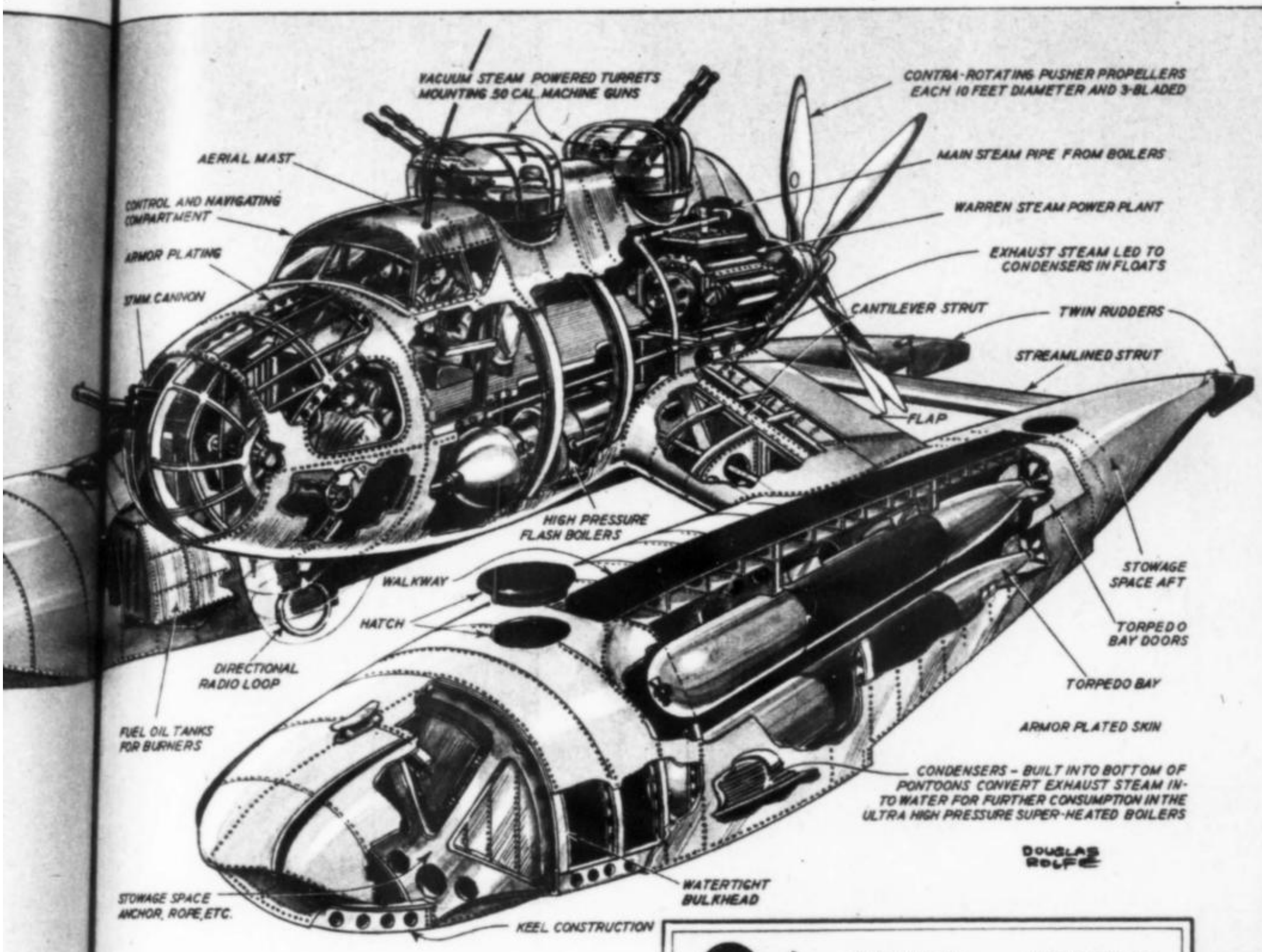
K. Goda, member of Japan's engineering society, Kojakusi, explains it this way:

"In oil tankers of Japan it is very rare to have steam plants. *Kuroshio-Maru* which

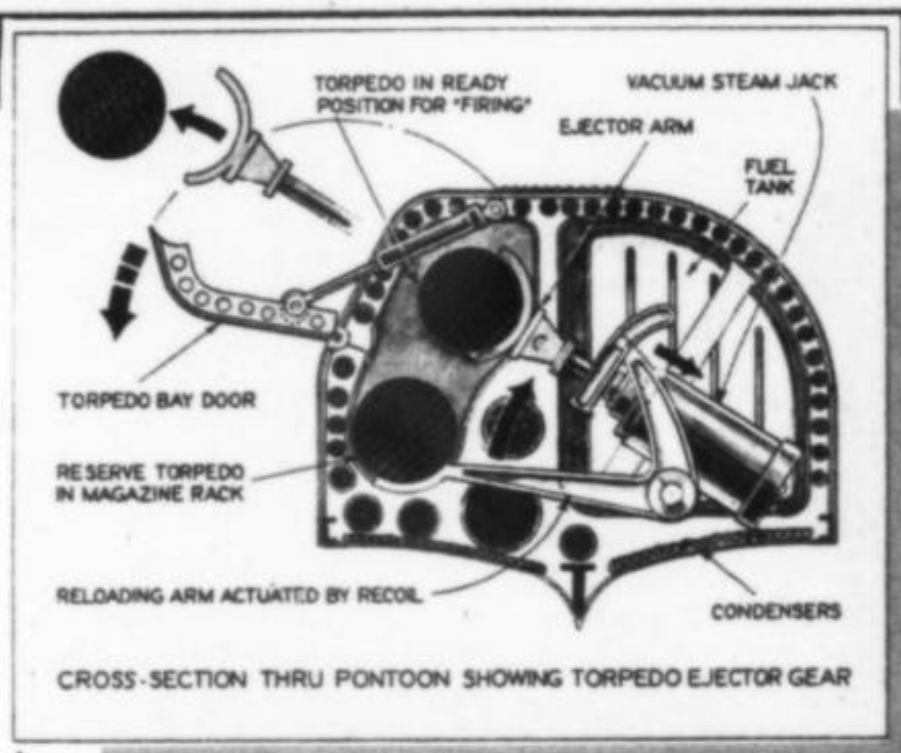


was recently completed, has three main boilers of such a modern forced-circulating type as never been found formerly in our country (Japan). The steam condition of these boilers is 21 kg/em^{2}G and 350° C. Each boiler generates steam 17,000 kg/h at normal, and 22,000 kg/h at maximum. They are of the Kawasaki La-Mont marine water tube type and each has heating surface of 333 square metres excluding air pre-heater, and is equipped with five oil burners, La-Mont water wall, superheater, economizer and tubular air preheater. These boilers were adopted for the purpose to save space and to improve the whole plant efficiency. One of these boilers was tested on land and obtained the efficiency of 87.29%."

But there's an extraordinary story that goes with the boiler for the new torpedo boat. It will be the lightest one of its power in the world. The first ultra light weight unit of the type was built by an American aircraft manufacturer with the idea of driving a steam airplane! The plans for the new one, however, were specially prepared by combustion



Cut-away drawing of hydroplane torpedo boat. Watertight bulkheads subdivide floats. Float noses carry food on extended trips. They also carry ground tackle.



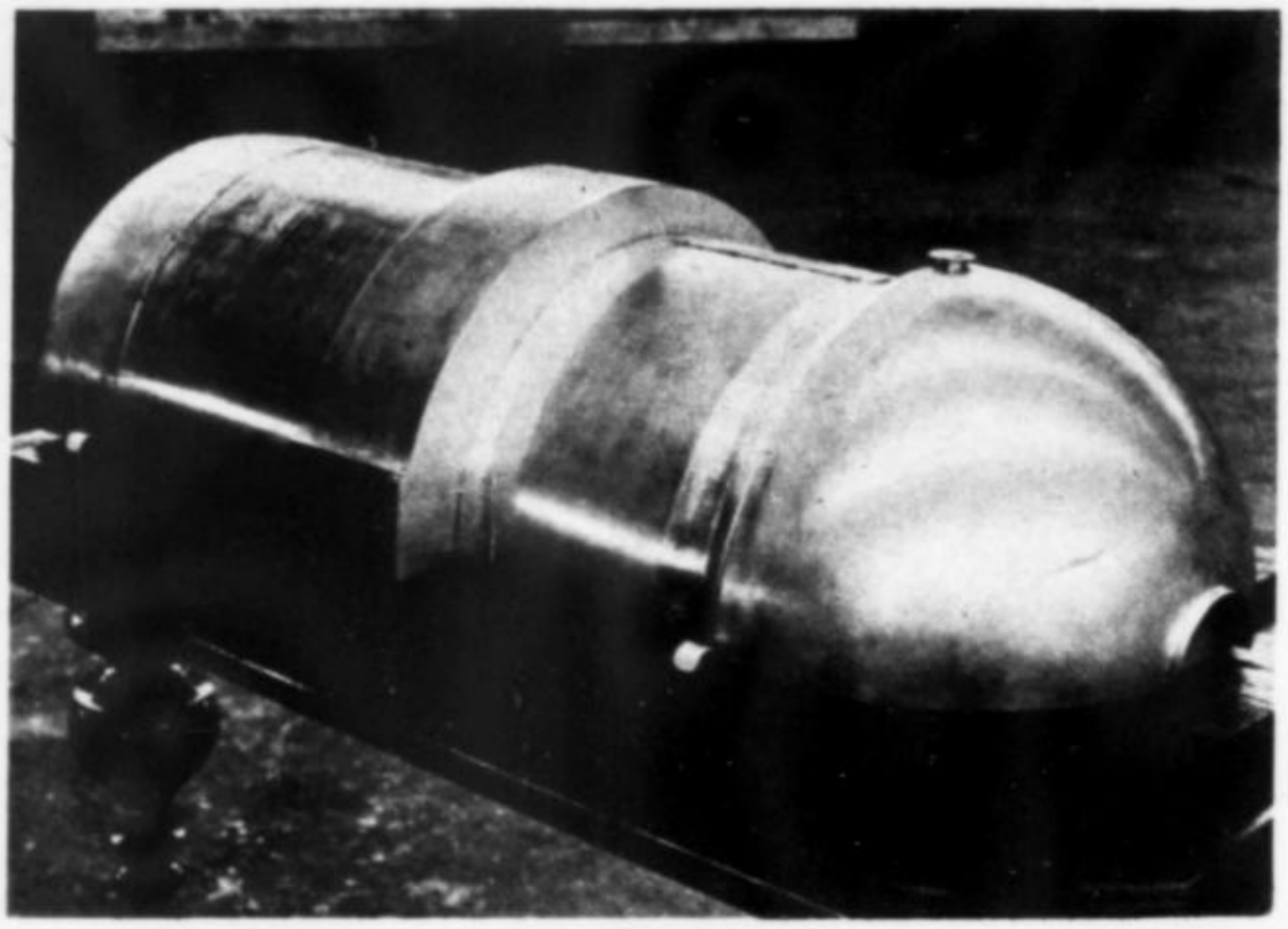
CROSS-SECTION THRU PONTOON SHOWING TORPEDO EJECTOR GEAR

Cross section of pontoon, showing torpedoes and steam torpedo ejector. Condenser tubes in pontoon change exhaust to water for boiler.

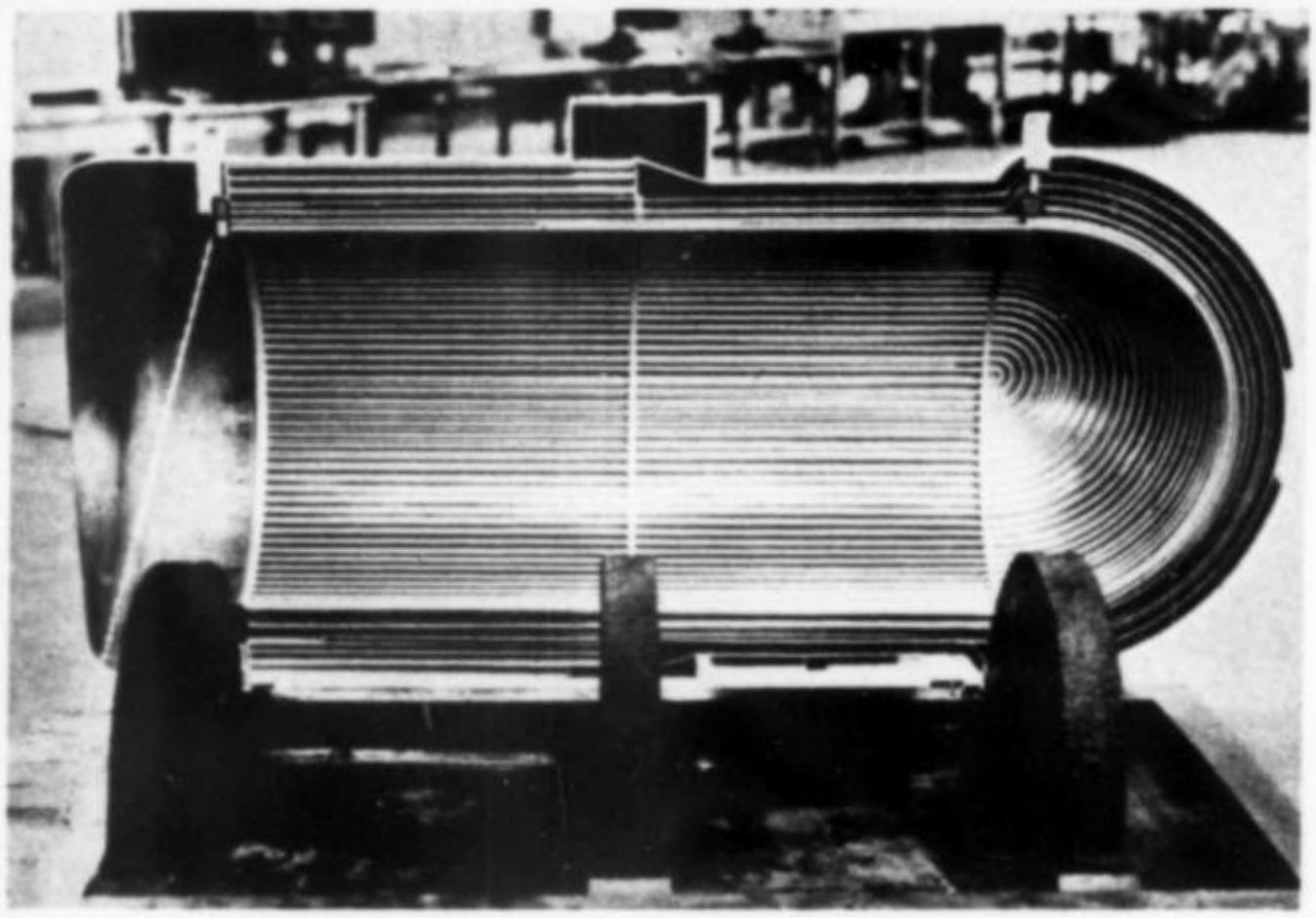
engineer J. T. McTarnahan, friend and co-worker of LaMont. And he had a powerful incentive to turn out a world-beating design. In "Mac" McTarnahan's own words, "If Commander LaMont were alive today he'd want to help win this war—the least we can do is to give his invention a chance to help win it. Somehow I feel that he will know—"

But when Commander LaMont devised his super steam generator he thought of it mainly as a power unit for the United States Navy. Even the inventor himself, never dreamed that one day torpedoes would be hurled by it from the world's most revolutionary naval craft. But today a LaMont boiler is destined not only to provide the 600-1,000 pound steam pressure to drive the propellers of the Bellanca hydroplane torpedo boat, but also to operate the catapult arms that throw the torpedoes clear of the pontoons. Yet no steam will escape from the boat. Every ounce will be condensed into water in the maze of condensing tubes in the bottom of the pontoons, and returned to the boiler.

Deep in the massive floats of the new ocean death dealer, will be the fuel tanks, carefully protected by the toughest armor that science can produce. But even if a stray shell



Outer shell of top half of LaMont airplane type boiler. Centrifugal blower draws air from central ridge.



Interior of airplane type LaMont boiler, showing small diameter water tubes. Water is driven through the tubes by pump while oil burner flames play on them.

fragment should manage to get through that steely hide, and puncture a tank, there's little chance of fire or explosion—for the fuel is practically the same as that in your home oil burner. And McTarnahan knows what fire and explosion can mean at sea. He's one of the few retired naval men who've been in a battleship gun turret when a big gun exploded. It happened on the old battleship *Iowa*.

As for rough weather, "We can seal her up as tight as a bottle," says Mr. Bellanca, "and no storm can swamp her." He pointed out that the great pontoons are vastly oversized compared to those of an airplane, enabling the hydroplane torpedo boat to ride a heavy sea like a huge water bug.

A veritable honeycomb of watertight compartments in the pontoons will make it practically impossible for enemy gunners to sink the boat with any gun that can be aimed quickly enough to hit it. In addition to the myriad compartments, the pontoons are designed with self-bailers which automatically remove any water that may accumulate from damage in action.

"The boat will be absolutely unsinkable for all practical purposes," the designer stated, "and it will be extremely difficult to disable it, as we have taken every precaution to protect its vital points and its crew with the most effective armor possible."

Among the additional safety factors of the boat's design, are its twin rudders —one at the tail of each pontoon. No chance hit on one of them will kill the controls.

Ample room is provided for complete radio equipment, which like the armor, may be of far greater size and weight than that used in airplanes, as this high speed baby dreadnaught does not fly. All the usual life saving equipment will also be carried in the crew's quarters, carefully located to be instantly available if needed.

Supplies can be stowed for use during long periods at sea or in hiding. And it need not waste its fuel during its inactivity, for its mighty steam generator can produce a full head of steam in a few moments—less time, in fact, than any other type of boiler ever built.

It cannot be torpedoed, for torpedoes will travel far beneath it. The vaunted magnetic mine is equally useless against the new superraider, for it can be all plastic—save for its armor. And the enemy's coastal patrols will have little chance to intercept a force of silent

transoceanic death dealers, racing through the darkness at 100 miles an hour.

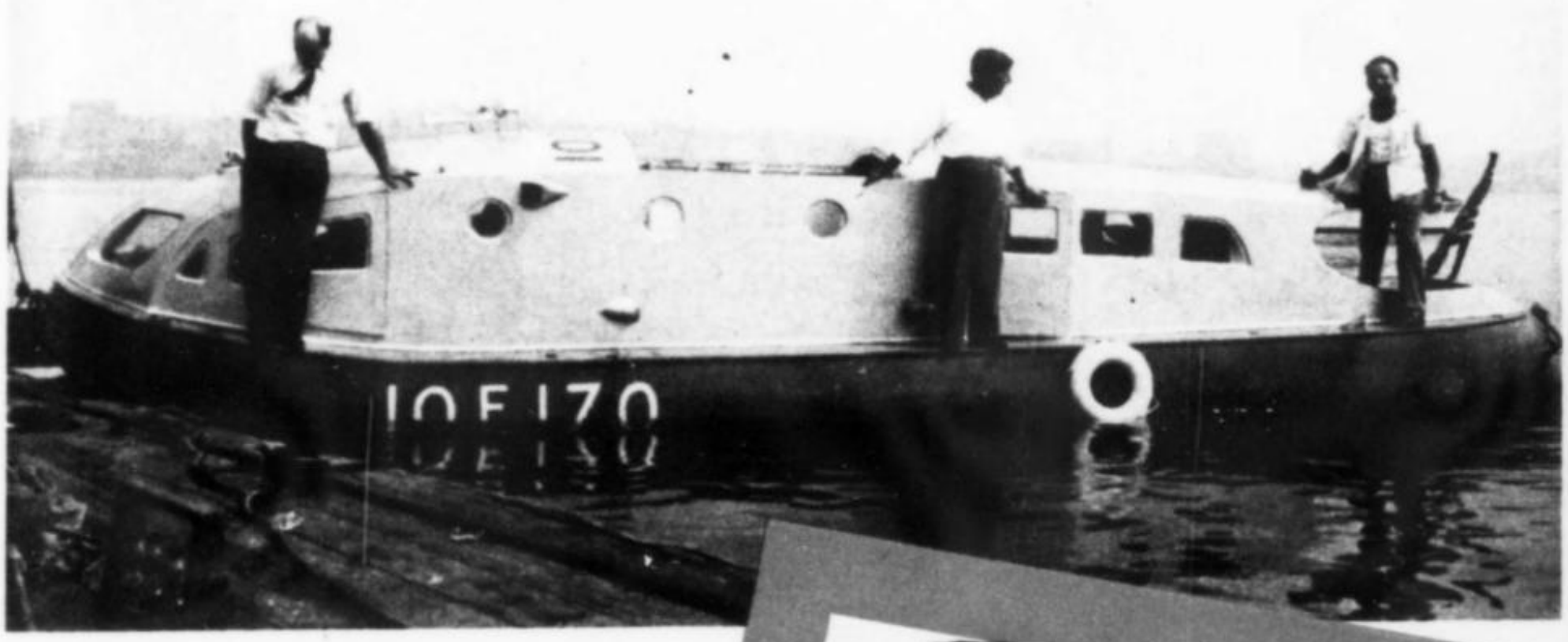
The men responsible for the development of this deadly new naval weapon are convinced that engineering skill ranks in importance with military skill in this war. They feel that America's designers have a duty to perform that is as vital as that of our generals, and that no engineer or designer has the right to shirk that duty.

The courage and strategy of our military men must be backed up by the constant efforts of those Americans who design and produce the instruments of war. That fact is apparent to all of us. But the designers of the new torpedo boat and its power plant emphasize that ordinary everyday effort is not enough.

Since the menace of the Axis first cast its shadow on the free peoples of the world, these men have acknowledged no quitting time in their determination to make as great a contribution to America's war machine as is humanly possible. Their theater of war has been the testing basin and the drawing board, and their adversaries stubborn factors of aerodynamics and stress and power. But if their victory over these can help our men in the field and on the seas to smash the Axis to its knees more quickly, they will feel amply rewarded.

Nothing has been overlooked in preparing the new boat. Mass production has been figured into every bulkhead and stringer, along with the elements of physics that have given it its speed and strength. It can be built either of metal or of plastic in vast quantity. And it will impose no added burden on our shipping, for it can reach the scene of action under its own steam, carrying its own supplies and its own ammunition. Its remarkable ability to perform the tasks assigned it, even under the most hazardous conditions, will make it a formidable ally of the craft that make up America's already deadly mosquito fleet.

In short, the new hydroplane torpedo boat will be able to leave its base on either coast of the United States, or perhaps, the bleak, forsaken waters of some uncharted shoal, and race silently to a distant objective.



This 65-mile-an-hour Garber landing boat is another type set for fame with LaMont steam boiler. Details cannot be revealed on performance except speed.

F. M. Bellanca, has been designing and building airplanes since 1910. Among his developments are the twin-engine system with both engines on central line of symmetry with central line of thrust, for stable flight on either engine. Also developed the central beam fuselage type of aircraft construction. His plane designs include both civilian and military ships of single and multi-engined types. He has been the Chairman of the Anti-Fascist Alliance since 1927, and since that date has devoted his efforts mainly to military aircraft.

Many of the aerial and naval weapons now in development by Mr. Bellanca cannot be revealed at this time. All of them evidence the designer's belief that speed in action and speed in production are both of vital importance.

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SEPTEMBER
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THE AIRACOBRA GETS ITS TEETH • SEE PAGE 87

MAJOR A. P. de SEVERSKY FORECASTS—

THE AIRPLANE OF TOMORROW

SEPTEMBER 1942

MECHANIX ILLUSTRATED

VOL. XXVIII NO. 5

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SPECIAL FEATURES

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LT. COMDR. BOB BARTLETT
U. S. Navy

ROBERT COLES
Noted astronomer, Assistant Curator of the Hayden Planetarium

NEXT MONTH!

Will your first big peacetime purchase probably be an automobile? Do you know it's likely to have a colorful plastic body that won't dent or scratch, an upper portion like a plane-gunner's unfogging "blister," a diesel or a direct-injection type engine, springs that will enable you to travel over rough terrain like a wartank but more comfortably? These and other features of the next autos are revealed in October in the second article in MECHANIX ILLUSTRATED's fascinating series on the post-war era's promise, "A World You Never Knew," by Donald G. Cooley. Major de Seversky's forecast on "The Plane of Tomorrow" in this issue is the brilliant opener for these revelations which scoop your daily newspaper. Don't miss a single one!

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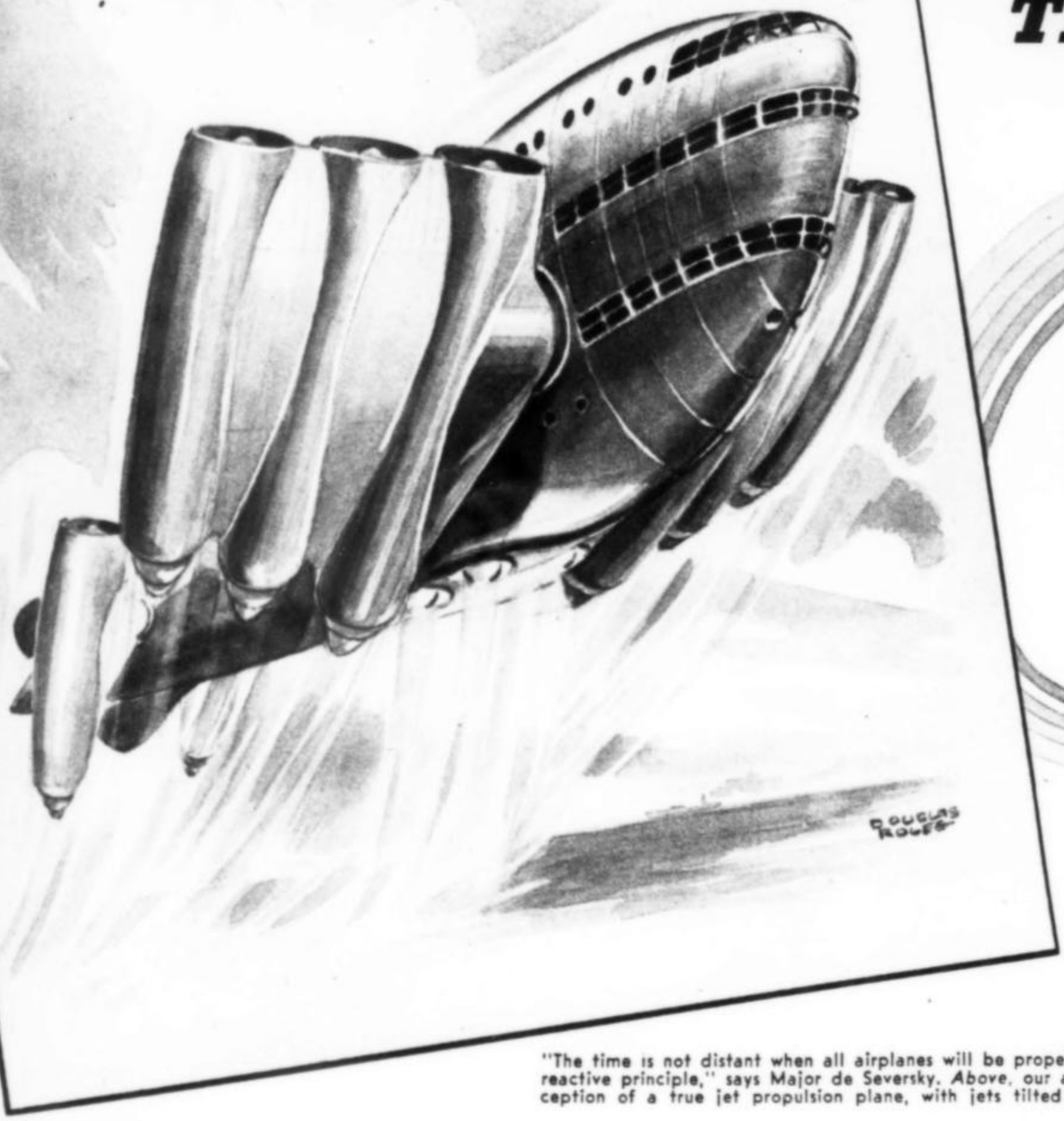
MEMBER AUDIT BUREAU OF CIRCULATIONS

Major Alexander P. de Seversky's Prediction of the Future of Aviation



"The time is not distant when all airplanes will be propelled on the reactive principle," says Major de Seversky. *Above*, our artist's conception of a true jet propulsion plane, with jets tilted for climb.

A WORLD YOU NEVER KNEW!

That's what's coming as soon as the war is ended. It's going to be a world filled with scientific and mechanical wonders such as you have never dreamed of!

"Science in general makes more progress in a year of war than in a decade of peace," Major de Seversky says in his opening paragraph on the opposite page.

Major de Seversky is correct. For MECHANIX ILLUSTRATED, inspired by the major's statement, recently assigned one of America's foremost scientific writers, Donald G. Cooley, to make an exhaustive investigation of the marvels of progress being made during this war. What Mr. Cooley has discovered makes, we believe, the most amazing and thrilling series of stories we have ever read.

This series will cover the whole field of industry. It will start with an article in the October issue of MECHANIX ILLUSTRATED on "The Automobile of Tomorrow"—and we promise you that the real facts contained in this story will be more thrilling than any fiction you've ever read! Don't fail to buy October MECHANIX ILLUSTRATED for "The Automobile of Tomorrow."

de Seversky *forecasts*

AIRPLANE OF TOMORROW

AS A goad to action, the instinct of self-preservation is stronger than the lure of profit or any other human urge. That is why science in general makes more progress in a year of war than in a decade of peace. This is especially true of inventions and mechanical developments used as weapons or otherwise directly related to the war.

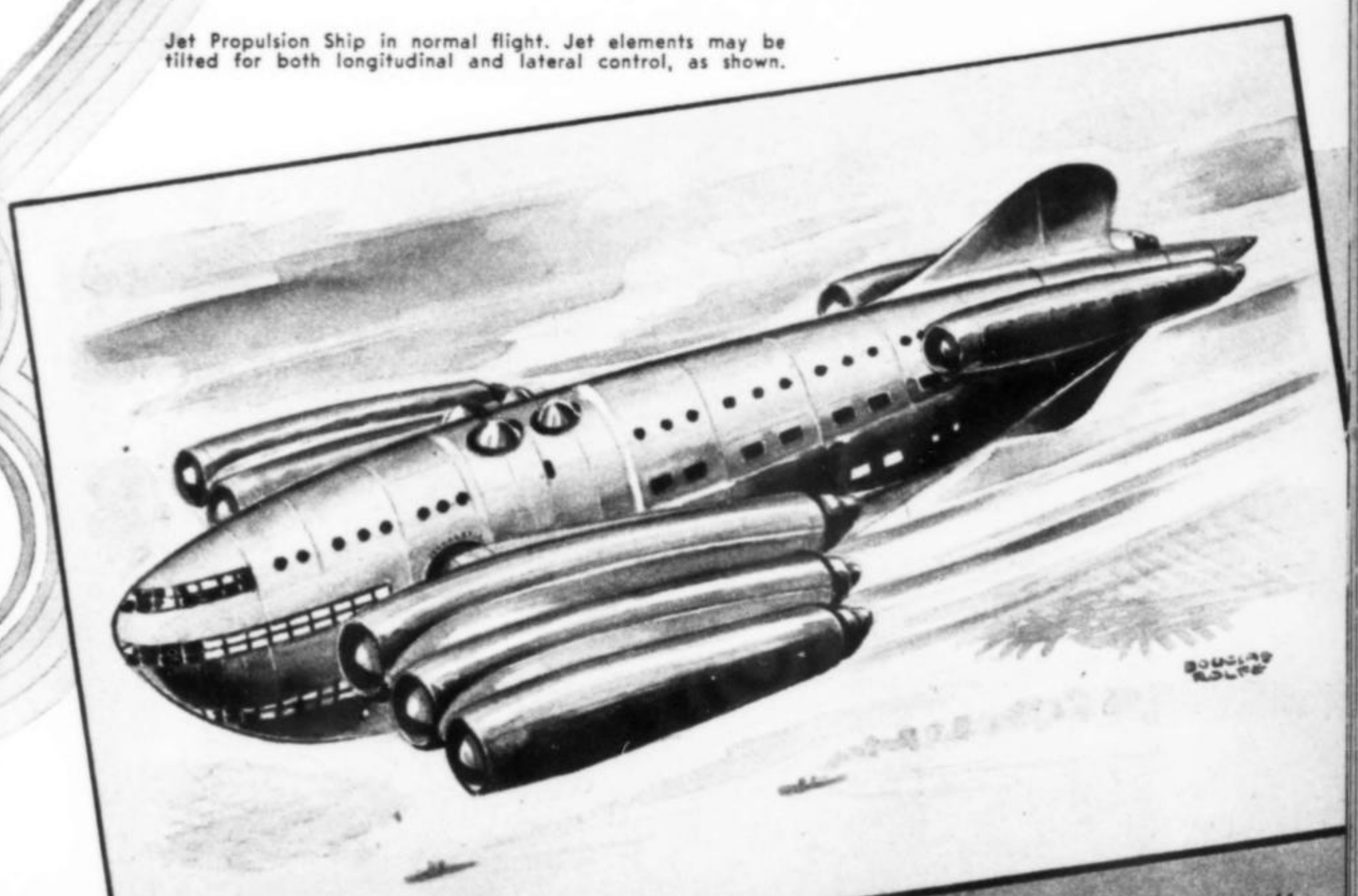
Certainly the airplane showed a technical advance in the four years of World War I which would have required perhaps a quarter of a century of peace-time puttering to accomplish. Before 1914 it was a primitive contraption which could not be rightly called a weapon at all, since it was practically unarmed. It was powered by an engine averaging not more than 100 horsepower and its useful load was negligible. By 1918, at the end of that war, the military plane had attained 150 miles per hour; it was powered with a single as well as multiple engines, each capable of 200 horsepower; it was well armed and could deliver explosive loads that could inflict real damage. Having entered the great conflict as a crude affair, it emerged as an efficient vehicle of transportation.

It is no less clear that World War II is providing a similar impetus to the unfoldment of the science of flight. Indeed, because we started at a point so far advanced, the actual perspectives of growth are immense enough to fire any healthy imagination. Even the directions of aeronautical progress already indicated by this war open up horizons that are all but limitless.

New principles of flight, new construction materials and fuels, increased efficiency of operation through improved precision of navigation instruments, have been indicated in the initial three years of World War II. Each of these things holds thrilling potentialities for the tranquil and civilized days to come after the horrors of war are ended.

Since Hitler plunged the world into the present tragedy, airplanes have raised their speed from 300 to about 450 miles per hour—an increase of 50 per cent. The advance has been even more impressive in the matter of size, range, and carrying capacity of aircraft. Progress has been especially marked in the

Jet Propulsion Ship in normal flight. Jet elements may be tilted for both longitudinal and lateral control, as shown.



enhancement of military characteristics. In terms of armor, armament, weight of explosives that can be hurled at targets, the 1939 airplane seems outdated against 1942, and primitive against the models scheduled to come off the production lines in 1943 and after. The one certainty is that the tempo of further development will speed up with every passing month of this life-and-death struggle.

Before the war, only the airlines operated regularly in the face of adverse weather. While individual military pilots were taught to fly by instruments, military operations on a large scale were mostly confined to favorable weather conditions. Today military aviation virtually ignores the weather, far beyond our peace-time scheduled flights. In vital military operations, weather has ceased to be a consideration except when the target itself is wholly obscured by dense fog. This triumph

Major de Seversky expects a large helicopter-type plane able to take off straight up to be an early development.

BOOSTER ROCKETS

"Rocket devices will be built into fighter planes as an essential adjunct for flash performance," enabling the ship to spurt away from danger or to gain tactical superiority.

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of science over nature has been accomplished by extraordinary improvements of precision instruments, de-icing equipment, and other essentials. What is more, for every advance already in use, a dozen greater ones are being perfected in the laboratory.

Radio and gyroscope have become mainstays of aviation. While a number of inventions in this field in relation to aircraft were made years ago, they lay dormant until wakened by the war. Take, for example, the radio locator. Back in 1928, under the auspices of the Guggenheim Aerial Research Fund, a radio altimeter was investigated. It operated on the basis of a radio wave. Released from a transmitter, the wave was reflected back to its source when it struck its object. Knowing the speed of the radio wave and the elapsed time, the altitude was thus obtained.

Though extensive experiments with this device were made under

Rocket bombs and radio gunsights on fighter planes will make them deadly

ENGINE EXHAUST
JET NOZZLE

Land catapults, possibly equipped with rocket propulsion, will enable much more heavily loaded bombers to take off.

A long line of de Seversky-designed P-35's in flight.

ABOUT THE AUTHOR:

Major Alexander P. de Seversky is now acknowledged as the supreme prophet of Air Power. His book, "Victory Through Air Power," (Simon & Schuster, $2.50) is *must* reading for every American. Since its publication a few short months ago it has leaped to the top of best-seller lists and has been accepted as the "bible" of the strategy of military aviation, just as Admiral Mahan's writings were accepted as the handbook of Sea Power.

Major de Seversky fought with the Russian Air Force in World War I. He lost a leg, shot down 13 enemy planes and was decorated by the Czar. Coming to America without money or friends, his genius was soon recognized. He was commissioned by the U. S. Air Force, organized his own aircraft company, invented innumerable aviation improvements, including the first automatic bombsight, and established many aviation records. At left, he is seen shaking hands with President Roosevelt as he was awarded the Harmon Trophy for Aviation.

the able direction of Jimmy Doolittle, its practical use lagged until the war gave new impetus to the work. Today the radio locator, operating on approximately the same principle, bids fair to wipe out the difference between night and day fighting.

It can locate airplanes more than 100 miles away. The British often can tell when the enemy across the English Channel starts his engines, even before the planes take to the skies. The detector registers the time of take-off and follows the airplanes through the entire flight. The defending craft can locate the enemy plane in total darkness. As yet, the pilot must be able actually to see the target in order to fire. But it is only a question of a short time before firing will be done by radio direction, so that craft will engage in their duels under totally "blind" conditions. By the same type of instruments, airplanes will be enabled to bomb unseen targets and anti-aircraft defense will be able to fire

Drawn by the author, this is a design for a stratosphere fighter conceived by Major de Seversky. Note the four propellers.

at invisible attackers in fog, overcast or darkness.

Another phase of aeronautical progress worth careful watching is the use of rocket catapults to facilitate take-off of overloaded airplanes. The Germans apparently are applying this principle extensively. By catapulting planes and thus overcoming initial resistance, they add greatly to the useful load of any aircraft. The Russians are reported to have used the rocket principle to propel aerial torpedoes against armored forces on the ground. The most advanced embodiment of that principle was announced recently by the Italians; a "propellerless" airplane was flown over Rome, the report claimed, at a speed better than 250 m.p.h. (Editor's note: See MECHANIX ILLUSTRATED, May, 1942.)

Experimentally, of course, reactive propulsion of the rocket type has been investigated by all countries, including our own. The time is not distant, I believe, when all airplanes will be propelled on the reactive principle, and today's propellers will seem a relic of an early aeronautical age.

Now used principally for take-off, rocket devices are certain to be utilized soon in combat. They will be built into planes as an essential adjunct for "flash performance," as an additional thrust to provide momentary tactical superiority, enabling the plane to extricate itself from dangerous tactical positions or to press home its attack. Thus bombers, for instance, having delivered their blow, may "rocket" into the overcast or out of reach of pursuing fighters. Almost unlimited perspectives are also opened up by the emergence of practical rocket propulsion in the matter of amazing speeds at super-altitudes. [*Continued on page* 156]

INVENTORS!

"The entire balance of fighting forces in this war may be upset at one blow by the emergence of one new invention," Major de Seversky says in the accompanying article.

Now, more than any other time in history, is the time for you to patent your ideas. Uncle Sam needs any ideas you may have to help win the war—and to assist in the making of a new world when peace comes. The distinguished members of the MECHANIX ILLUSTRATED Advisory Inventions Board, listed below, urge you to send in your ideas to Washington, at once, for the good of the nation. Major de Seversky's article may suggest ideas to you. The MI series, starting next month, "A World You Never Knew," should suggest many other inventions to you. Get busy, *immediately*!

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LT. COMDR. BOB BARTLETT—U. S. Navy.
ROBERT COLES—Noted astronomer and Ass't. Curator of the Hayden Planetarium.

A *SIXTH* Front

by Major Malcolm Wheeler-Nicholson

Military Expert, Author of the forthcoming book, "Why Win the Hard Way?"

AT THIS writing, the United Nations are doing much talking about a "Second Front" against the Nazis, presumably in Western Europe. The Nazi successes in Egypt seem to call for some positive action immediately.

I believe the readers of MECHANIX ILLUSTRATED should understand the strategic problems involved in any proposed attack on Europe.

No matter what the fortunes of war may be in the meantime, the eventual United Nations attack on Berlin will be in the form of a final assault on an inner citadel. The status of the European continent at this date, is that of a vast fortress ringed about with fortifications from the northern tip of Norway to Spain and around the Mediterranean to the Kerch Peninsula on the Black Sea. Those fortifications are especially formidable along the coasts of Holland, Belgium and France, the

A military expert tells the science which lies behind the coming assault on Nazi Europe.

nt Against The Nazis

Mechanix Illustrated Drawing
By Reynold C. Anderson

"All Europe is now, in effect, one great fort. It must be attacked with ancient siege tactics"—*the author.*

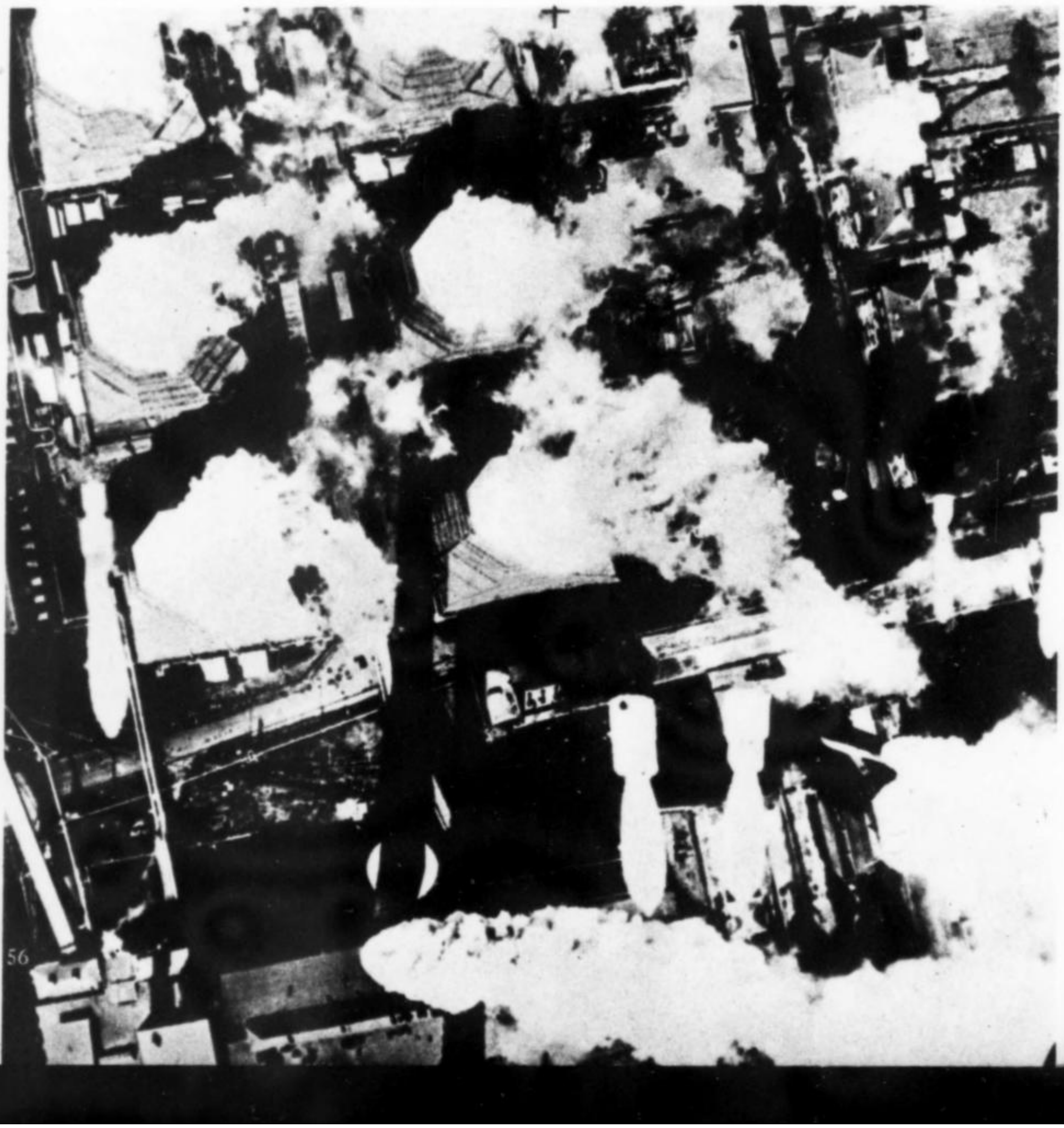
"'Footwork,' in the form of many coastal raids, will force the enemy to dispersal." *Above*, a line of marine landing boats

logical and most easy route for an invasion springing from England.

These fortifications have been steadily strengthened, starting from the date of the armistice with defeated France. Hundreds of thousands of slave laborers under the skilled direction of German military engineers have shifted the guns of the French Maginot Line, the Czechoslovak Little Maginot Line and similar fortifications throughout Europe to these Axis defensive works against over-seas invasion.

With steel and concrete emplacements, concealed airplane hangars, thousands of heavy guns, machine guns and excellent intercommunication facilities, isolated frontal assault on these lines anywhere in Europe will be a costly undertaking faced with almost

"The bomber is the modern form of the ancient catapult." *Below*, white-painted bombs drop in the 1,000-bomber raid on Cologne.



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almost

Cologne.

And it's coming, Mr. Hitler! Just look at these American soldiers practicing a landing, in a Northern Ireland camp!

certain failure. In addition these lines of fortifications, on three sides, are situated behind great water ditches or moats, the moats of the North Sea, the English Channel, the Atlantic Ocean and the Mediterranean Tyrrhenian, Adriatic, Aegean and Black Seas. Naval and naval-convoyed attack against land-based fortifications have always been difficult, costly and seldom successful, even in the days when the maximum range of a coast artillery gun was 25 miles. With the range of coast defense increased from 25 miles to 500 miles or more by the simple expedient of carrying high explosives in airplanes, the attacker's task today would be practically suicidal. Without land bases for short range fighter planes to give him a protective umbrella against enemy aircraft, no military or naval commander in his senses would recommend such attack.

There are no bases along the three sides of the fortress, within short range fighterplane distance except the British Isles themselves and Malta. The greatest concentration of Axis air power is kept within striking distance of these two points to avert the possible use of these two bases. To top it all, the Axis possesses the advantage of interior lines, it can move its forces by the shortest lines to a threatened point. This actually means tripling the strength of its air and ground components. It can strike with the greatest concentration of force in practically any direction, against an attacker who is forced to move by the longest lines with the utmost dispersion.

The task looks impossible. It is impossible looked at from the viewpoint of 1914-18, with its expeditionary force and "second front." A United Nations attack, in an effort to establish a "second front" in any one of several possible areas, such as Norway, France, Italy or the Balkans, would probably be welcomed by the Axis, for such attempt would be foredoomed. The Wehrmacht would simply dig in on the Russian front and concentrate the forces thus released against the foolhardy invader.

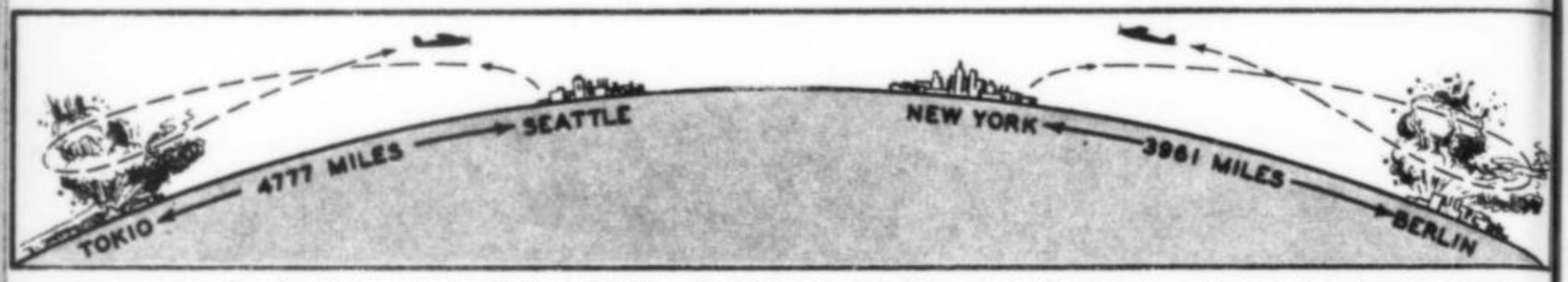
What, then, is the answer?

The answer is to cease looking at Europe as an aggregation of nations and national boundaries. The answer is to look at Europe as a great continental fortress, protected by great water moats on three sides and heavy land fortifications on the fourth or Russian side.

[*Continued on page* 157]

Beralite Will Bomb Berlin

An amazing new alloy can now make our war planes lighter, stronger, and more powerful than ever before—



The wonder alloy, Beralite, can bring Berlin and Tokio well within mass-bombing range. Our bases would be east and west coasts.

An interview with E. Burke Wilford, President, Cooper-Wilford Beryllium, Ltd., by George Daniels

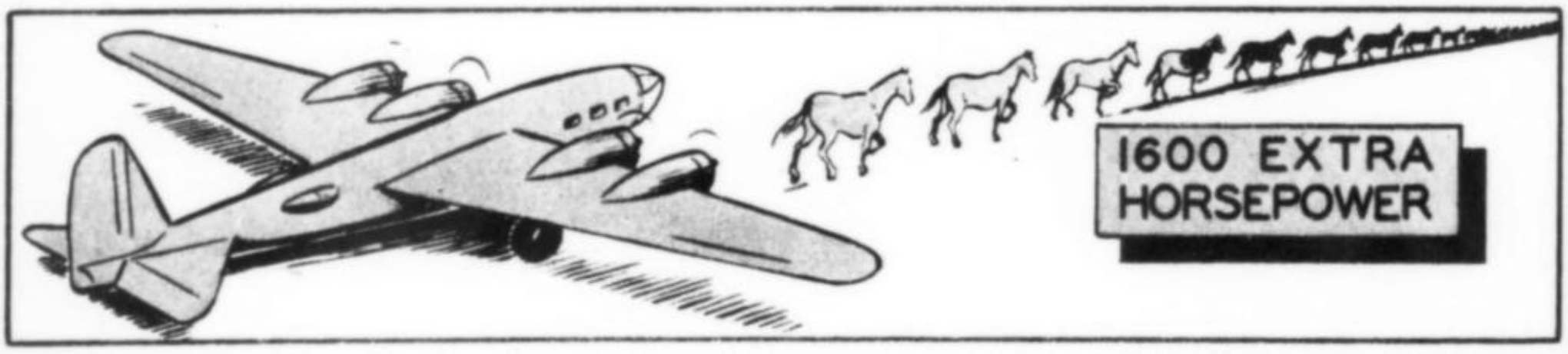
YES, Beralite can help bomb Berlin and Tokio, in force. Beralite is an alloy of the wonder metal for aircraft, beryllium, and aluminum: an alloy that was proclaimed an absolute impracticability by the top-ranking experts only nine months ago. Hugh S. Cooper and E. Burke Wilford, however, didn't think it was impossible, and for a very good reason. Cooper-Wilford Beryllium Ltd., of Philadelphia, was already experimentally producing it.

"The new alloy is lighter, stronger and harder than the conventional alloys of aluminum," Mr. Wilford told me, "and it has a greater fatigue strength and stiffness than duralumin." On the giant Douglas B-19, Beralite could save enough structural weight to enable the ship to carry an extra 9 tons of bombs. If the weight-saving were translated into a bigger fuel supply, it would give the ship a range of approximately 10,000 miles instead of the present 7,500.

But that's only a small part of the magic in Beralite. It can also increase the horsepower of an engine as much as 15%. On the B-19, that would amount to 1,600 more horsepower, or more than enough extra to fly an Airacobra or a P-40, or tow a tank-carrying glider. It could transform a 700 horsepower motor into an 800 horsepower motor, without changing a single dimension. And the motor would actually be 10% lighter than it was before the power was increased 15%. Keep in mind that this is not just an idea—this incredible alloy is in pilot production at this very moment.

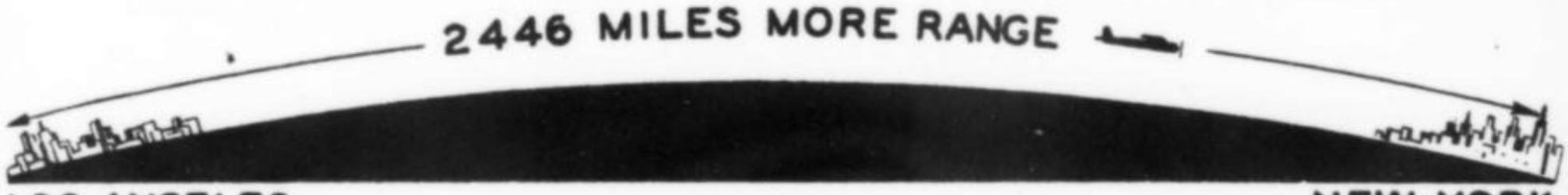
One of the reasons that an alloy of beryllium and aluminum seemed impossible to many metallurgists was the fact that the melting points of the two metals were more than 1,000 degrees apart (Be - 2345°; Al - 1260°). Most of the world will have to go on wondering how that problem was overcome. The secret will have to be kept at least until the war ends, for Beralite has given America an advantage our enemies would like to share.

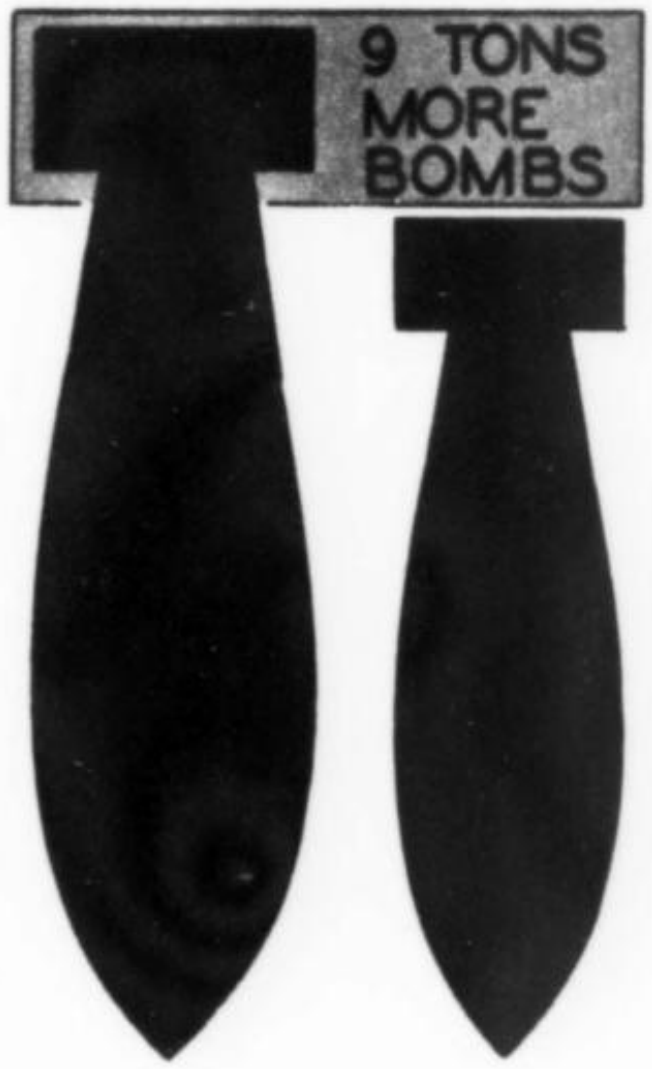
When Burke Wilford tossed a little bar of Beralite into my hand, I asked him if he wasn't a little afraid that our unfriendly neighbors throughout the world might start turning the



Without changing a single engine dimension, ships like our B-19 can increase their horsepower by 1,600—and save weight doing it!

Weight saved by use of Beralite throughout construction of B-19, *above*, would enable it to carry extra 9 tons of bombs. Range increase would equal trip from New York to Los Angeles.





stuff out themselves. He smiled and told me that they'd been trying that for a long time and hadn't hit on the answer. It seems that they can see the value of beryllium as a partner for aluminum, but that's about as far as they get.

The Germans took 2,000 tons of beryllium ore out of South America in 1940—before the ore was made strategic by executive order in May of 1941. Apparently, like our own metallurgists, they have been successful in alloying beryllium with copper and other heavy metals to make many machine parts—such as springs and diaphragms that "never get tired." But Beralite is all ours at present.

It may seem a little odd that such a valuable element as beryllium went practically unnoticed for such a long time. It was first detected 144 years ago, by a Frenchman named Louis Nicolas Vauquelin. Louis was quite an investigator, having also been the first man to run across chromium. Now fate has apparently decreed that Hugh S. Cooper, who has brought Vauquelin's work to practical use, has given us a means of helping to win this war in the air.

The inability of science to produce beryllium in a satisfactorily pure form was one of the reasons for its century of insignificance. Even when comparatively pure beryllium was produced in small quantities, by Cooper, it was too expensive to be practical. Means were devised, in many instances, by which the metal could be alloyed with other metals, without ever really existing by itself. Compounds, such as beryllium oxide, are added to the other metal to achieve the remarkable results: but this is the first

COMING . . .

HIT-AND-RUN M

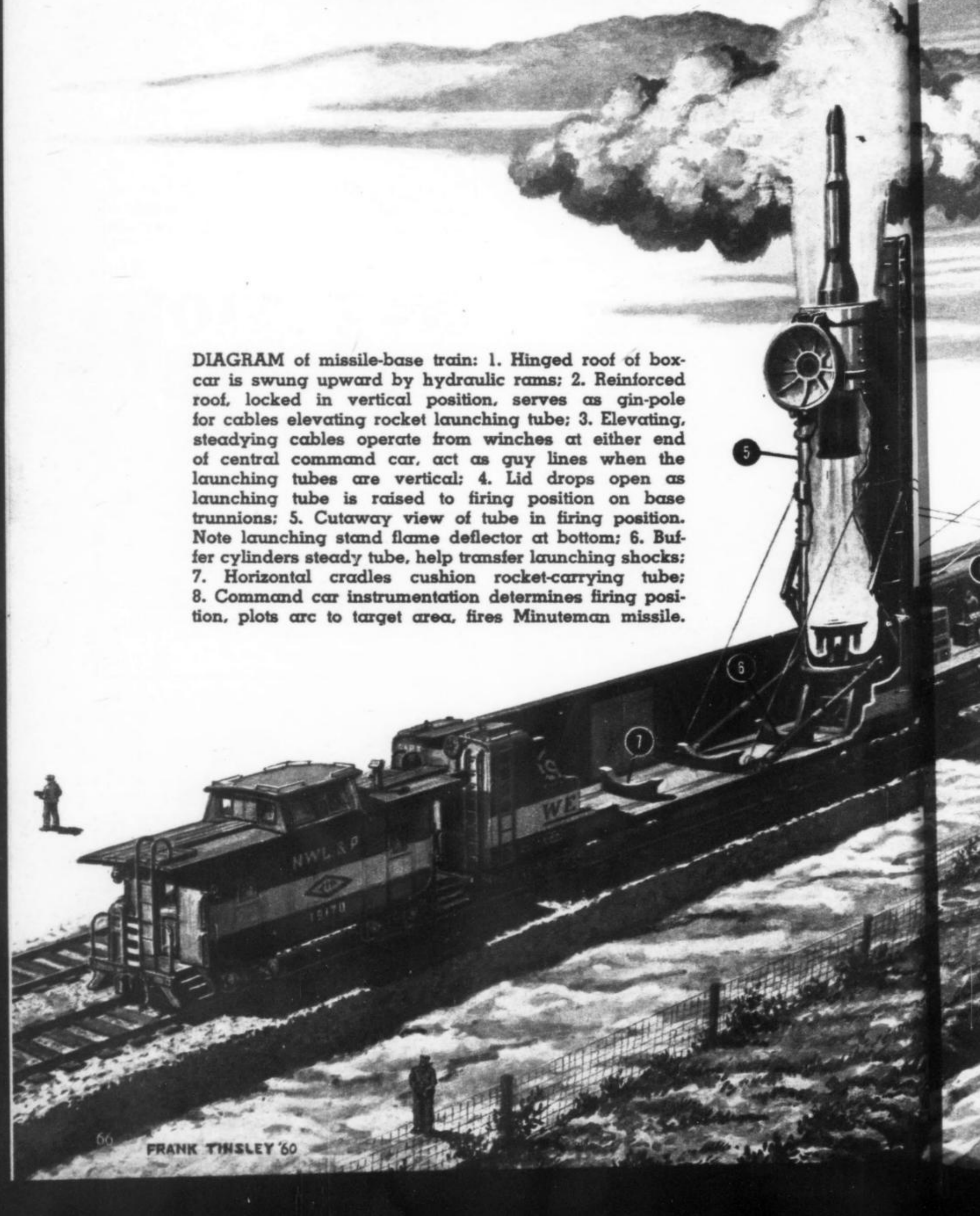


DIAGRAM of missile-base train: 1. Hinged roof of box-car is swung upward by hydraulic rams; 2. Reinforced roof, locked in vertical position, serves as gin-pole for cables elevating rocket launching tube; 3. Elevating, steadying cables operate from winches at either end of central command car, act as guy lines when the launching tubes are vertical; 4. Lid drops open as launching tube is raised to firing position on base trunnions; 5. Cutaway view of tube in firing position. Note launching stand flame deflector at bottom; 6. Buffer cylinders steady tube, help transfer launching shocks; 7. Horizontal cradles cushion rocket-carrying tube; 8. Command car instrumentation determines firing position, plots arc to target area, fires Minuteman missile.

N MISSILE BASES

An Original MI Design by FRANK TINSLEY

IT looks like any other ordinary train as it rumbles over the countryside. But if you could see through the weathered boxcar walls you'd realize that this tired-looking ten-car train is a startling hit-and-run missile base containing the most up-to-date weapons system in existence. Its purpose: to provide a mobile launching pad for the Minuteman—Uncle Sam's latest and most powerful solid-fuel missile.

MI's version of the Minuteman train differs materially from those previously published. The original concept of an undisguised missile launcher, mounted on a flatcar, is now outmoded. It is now considered essential to house the bird's propellant charge and delicate mechanisms in a shock-absorbent, air-conditioned container. This lengthens its storage life and enables it to operate instantly, [*Continued on page* 165]

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Volume XXV
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The big, twin-engined Lockheed roars through the night, headed for New York's La Guardia Field. The "soup" outside is so thick the two men in the plane have difficulty seeing the tips of their wings. The ground is completely invisible.

Will they find New York? Will they discover La Guardia Field, hidden as it is below heavy cloud blankets?

You bet your life they will—they'll travel in a straight line and hit La Guardia Field "on the nose!" And why not? They are riding the radio beam, that mysterious magic pathway that turns night into day and makes cloudy skies clear. You'll find out all about it, and just how it works, when you read "Riding the Radio Beam" in the December issue of MI.

There will be plenty of other interesting features in this issue, as well as a varied collection of timely news shorts, photographic hints and easy-to-build workshop projects.

Don't miss the December issue of MECHANIX ILLUSTRATED, on sale at all newsstands on the first of November!

ROBERT HERTZBERG, Editor

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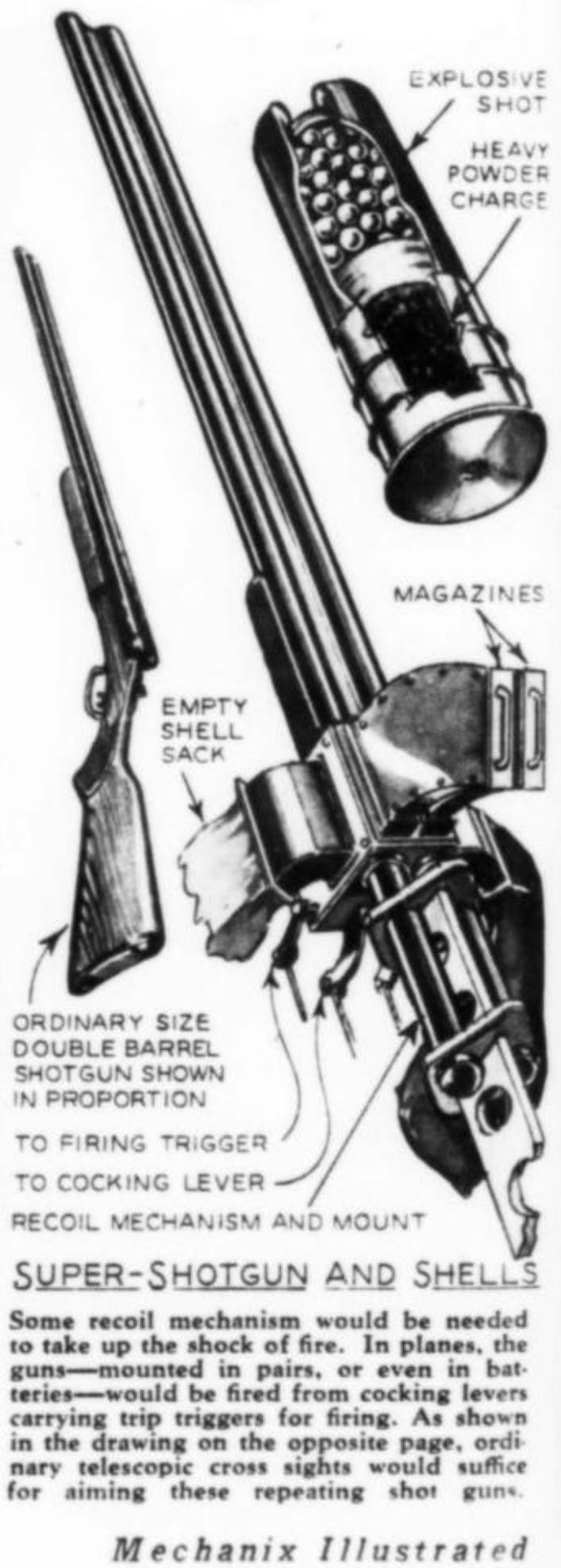
Fighting The Planes

At point blank range it is doubtful if any plane could withstand a hit on even a minor portion of the plane's structure. Even at longer ranges, the scattering effect of the shot would make accurate marksmanship a great deal less difficult than it is at the present time.

EXPOSED TO A HEAVY FIRE OF EXPLOSIVE SHOT FEW IF ANY PLANES COULD WITHSTAND A SINGLE HIT ON ANY PART OF THE STRUCTURE

Below: Fired from the ground, or from mobile units, at low flying attack planes, this weapon would be even more effective than when fired from a plane. One charge of explosive would be enough to stop a "Stuka," or dive bomber, in its tracks.

MOBILE GROUND DEFENSE AGAINST DIVE ATTACK



SUPER-SHOTGUN AND SHELLS

Some recoil mechanism would be needed to take up the shock of fire. In planes, the guns—mounted in pairs, or even in batteries—would be fired from cocking levers carrying trip triggers for firing. As shown in the drawing on the opposite page, ordinary telescopic cross sights would suffice for aiming these repeating shot guns.

Of Tomorrow!

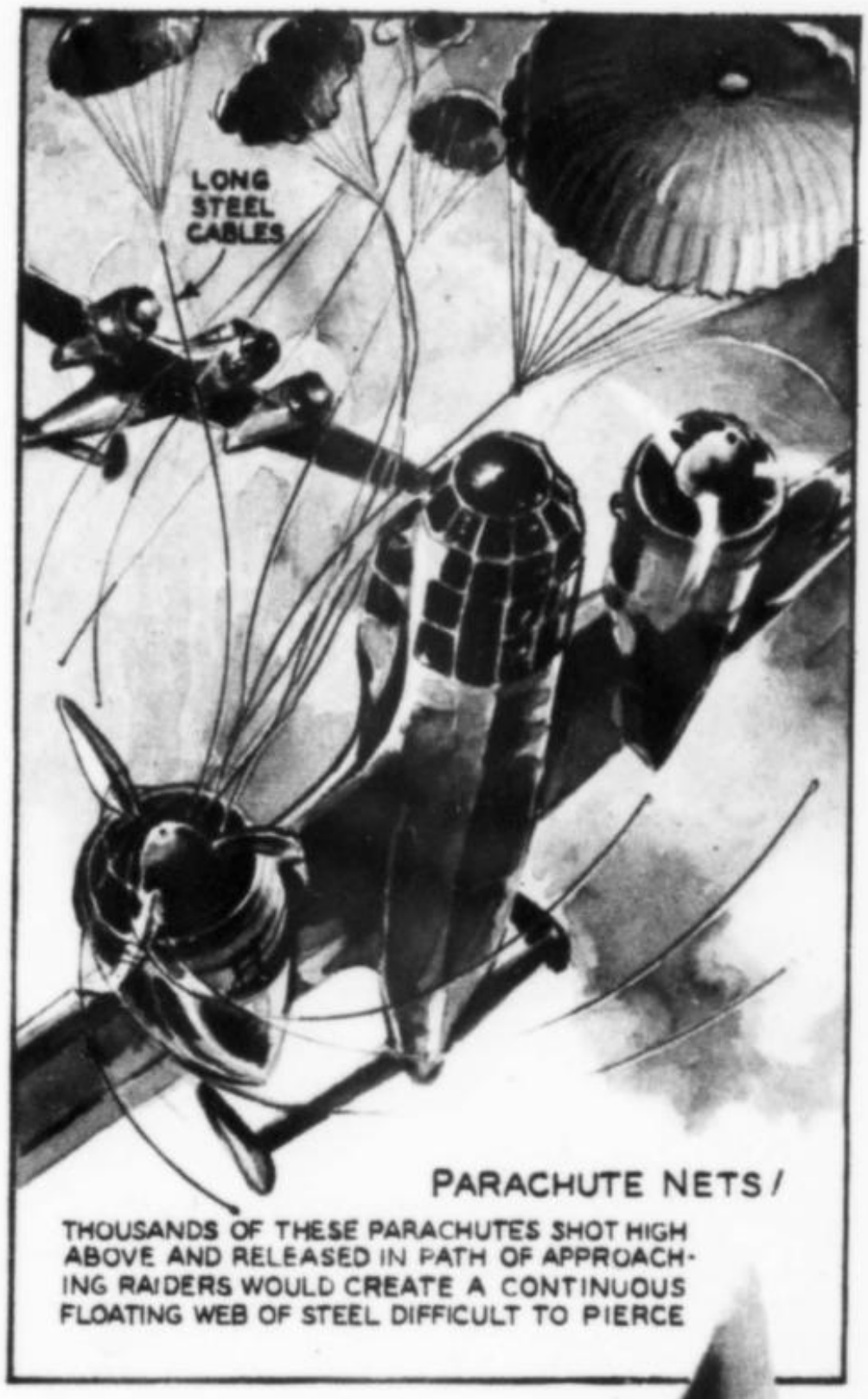
ANTI-AIRCRAFT measures, offensive and defensive, have greatly improved since the first World War, but even so, the present war has shown the need for a much greater efficiency than is displayed by the weapons now in use. That the war will produce new and deadlier weapons in this field is quite certain, if it carries on into 1941 and even longer.

What form these new anti-aircraft weapons will take is anybody's guess at the moment. Novelties such as the German screaming bombs and, more recently, the use of aerial torpedoes against land objectives seem to prove that nothing can be too fantastic in the realm of anti-aircraft developments.

On these pages are shown two conceptions by our aviation artist which have practical possibilities and which may soon be employed.

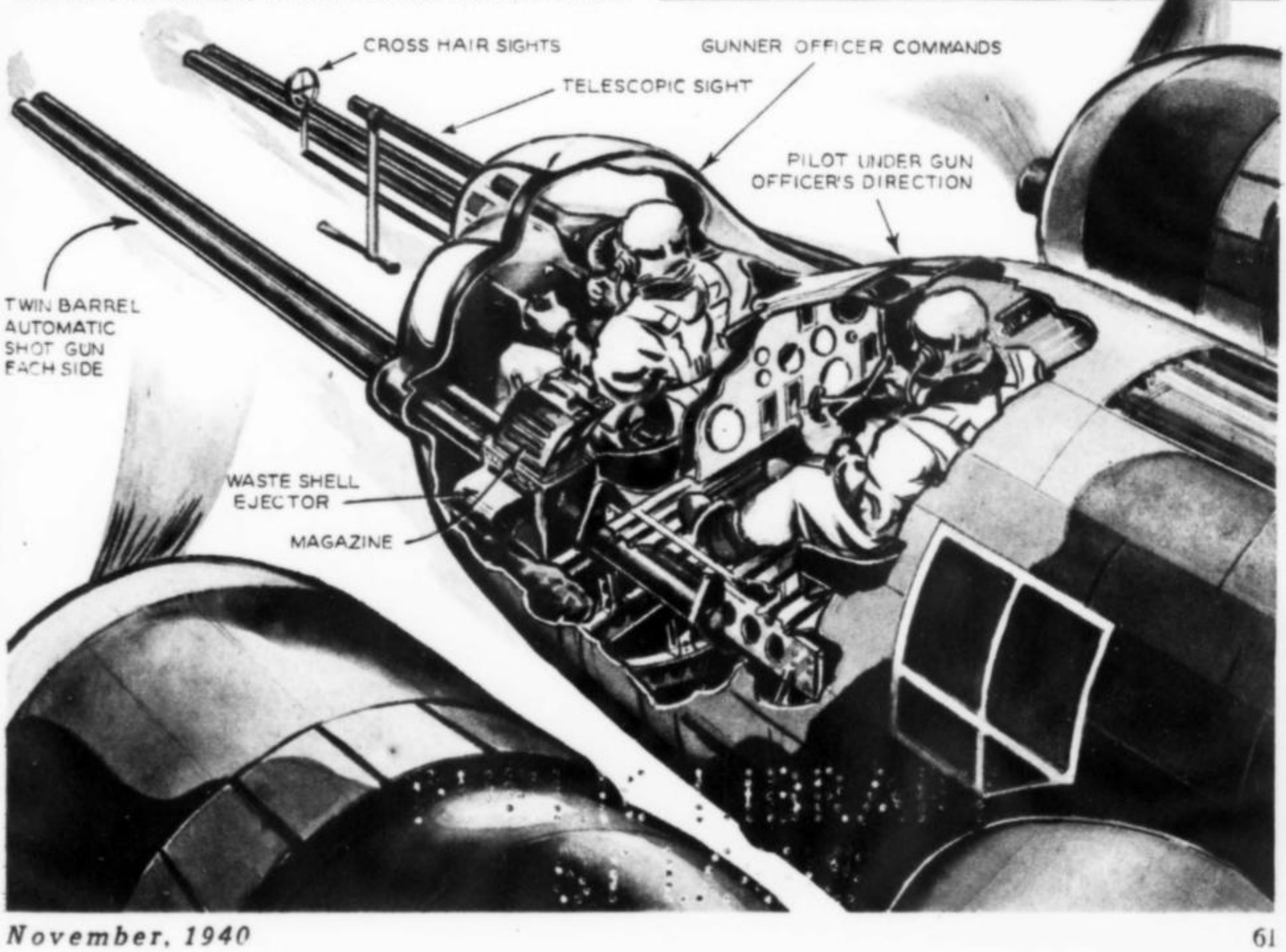
The first is a huge, smooth-bore repeating shot gun to hurl widely spreading plain and explosive shot, which would be a deadly weapon both for air fighting and for standing off dive bomb attacks from the ground.

The second are parachute nets, hurled high into the heavens by means of shells with just sufficient explosive content to release the chutes and cables, which would drift to earth.



PARACHUTE NETS /

THOUSANDS OF THESE PARACHUTES SHOT HIGH ABOVE AND RELEASED IN PATH OF APPROACHING RAIDERS WOULD CREATE A CONTINUOUS FLOATING WEB OF STEEL DIFFICULT TO PIERCE



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EW WINGS
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TODAY'S MAGIC IS TOMORROW'S SCIENCE!

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1940

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Number 5

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AVIATION IS booming these days! Plane factories from coast to coast are running on 24-hour schedules, yet the orders still pile up; air lines are booked heavy with passages, with waiting lists hoping for cancelled reservations; aviation has started on its greatest boom!

What could be more timely than the next two articles of MI's YOUR JOB series—both of them on aviation?

The first article, in the next issue, covers flying itself, in all its phases. The following article, in the May issue, will take up the jobs of those men who stay on the ground, yet who are vital to aviation.

With a crying need for skilled men, men who are specialists in some phase of flying, these are two articles that no young man in America can afford to miss!

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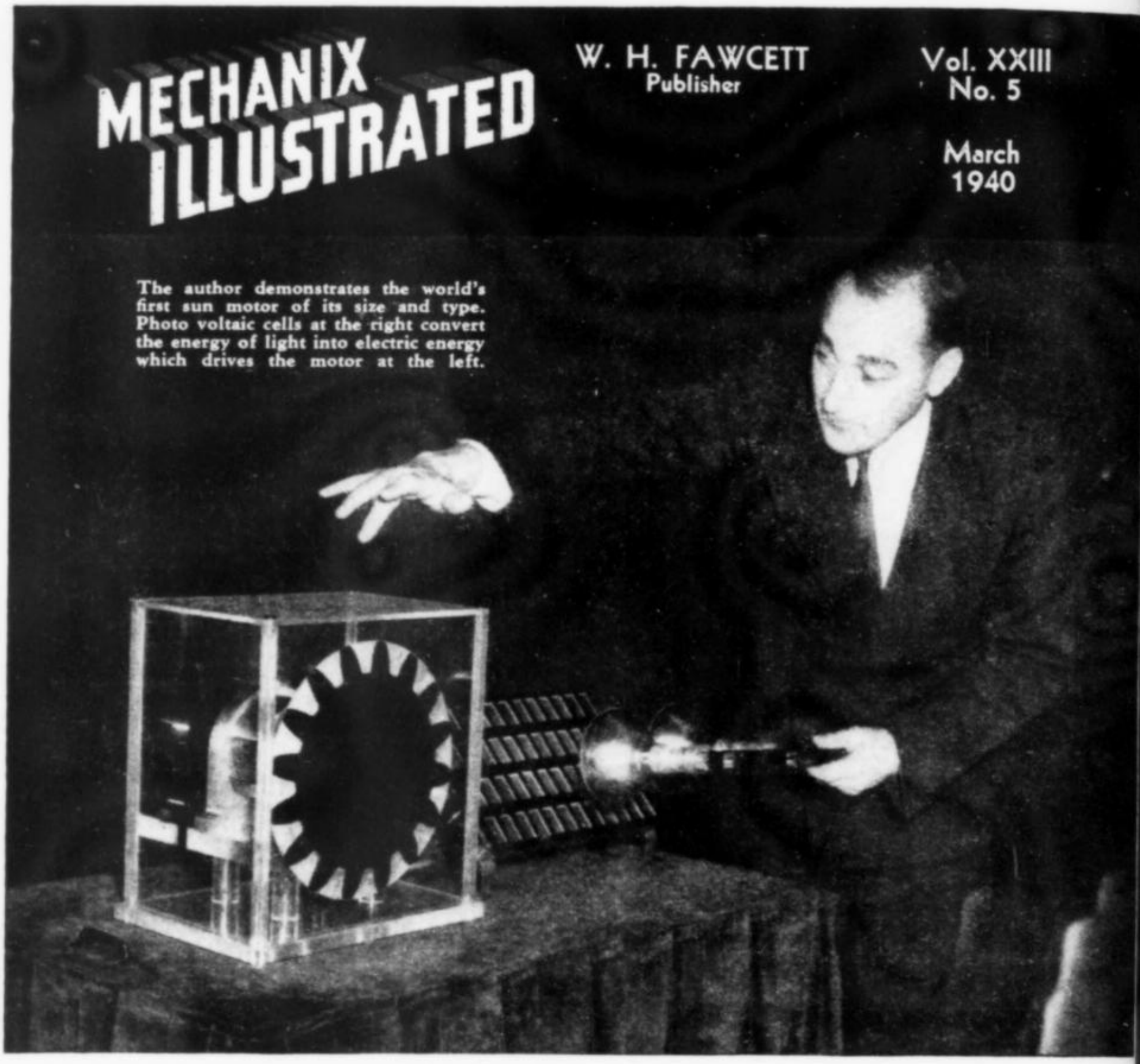

The author demonstrates the world's first sun motor of its size and type. Photo voltaic cells at the right convert the energy of light into electric energy which drives the motor at the left.

Today's Magic is Tomorrow's Science

by William A. Gluesing

Director of the General Electric "House of Magic" at the New York World's Fair

WHEN the people who have seen the General Electric "House of Magic" at the New York World's Fair ask us why we do not build them a sun motor to run their automobile, our usual joking answer is: "What would you do when the sun goes down?"

The scientists of the research laboratory who are responsible for these new developments never make predictions, even though it sometimes seems that that is what everyone expects them to do. Speaking as an individual and without any pretense to the role of scientist, I am usually willing to let my imagination run into the future after first exacting a promise that no one will come back to me 200 years from now and say you told me "so and so" and it hasn't materialized.

As a rambler of the Jules Verne variety, then, I can tell you what some of the things

CURRENT GENERATED BY CELLS IS COLLECTED AND DISTRIBUTED THROUGH FREQUENT DIVISION STORAGE STATIONS

IT IS ESTIMATED BY SCIENTISTS THAT SOLAR RADIATION CAN DEVELOP OVER 100,000 HORSEPOWER PER SQUARE MILE OF VOLTAIC CELLS

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SOLID COPPER ANODE WITH OXIDIZED TOP

SECTION THRU VOLTAIC CELL

ELECTRICALLY CONTROLLED SLIDING GLASS SUN ROOF

VENTILATING REGISTERS

FLEXIBLE OVERHEAD COLLECTOR ARM FOR SECONDARY CIRCUIT

ENERGIZED RAILS

AIR CONDITIONING AND HEATING UNIT

RADIO PHONE

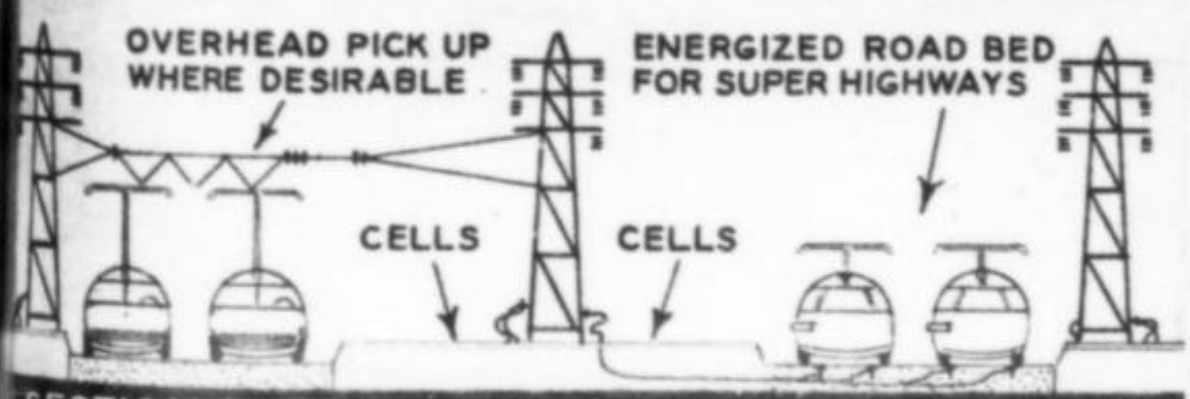
STORAGE BATTERIES UNDER FLOOR PROVIDE POWER FOR SHORT TRIPS AWAY FROM ENERGIZED HIGHWAYS

BUILT-IN TELEVISION AND RADIO SET

SPRING CONTACT ROLLER BRUSHES PICK UP CURRENT FROM INLAID COPPER RAILS

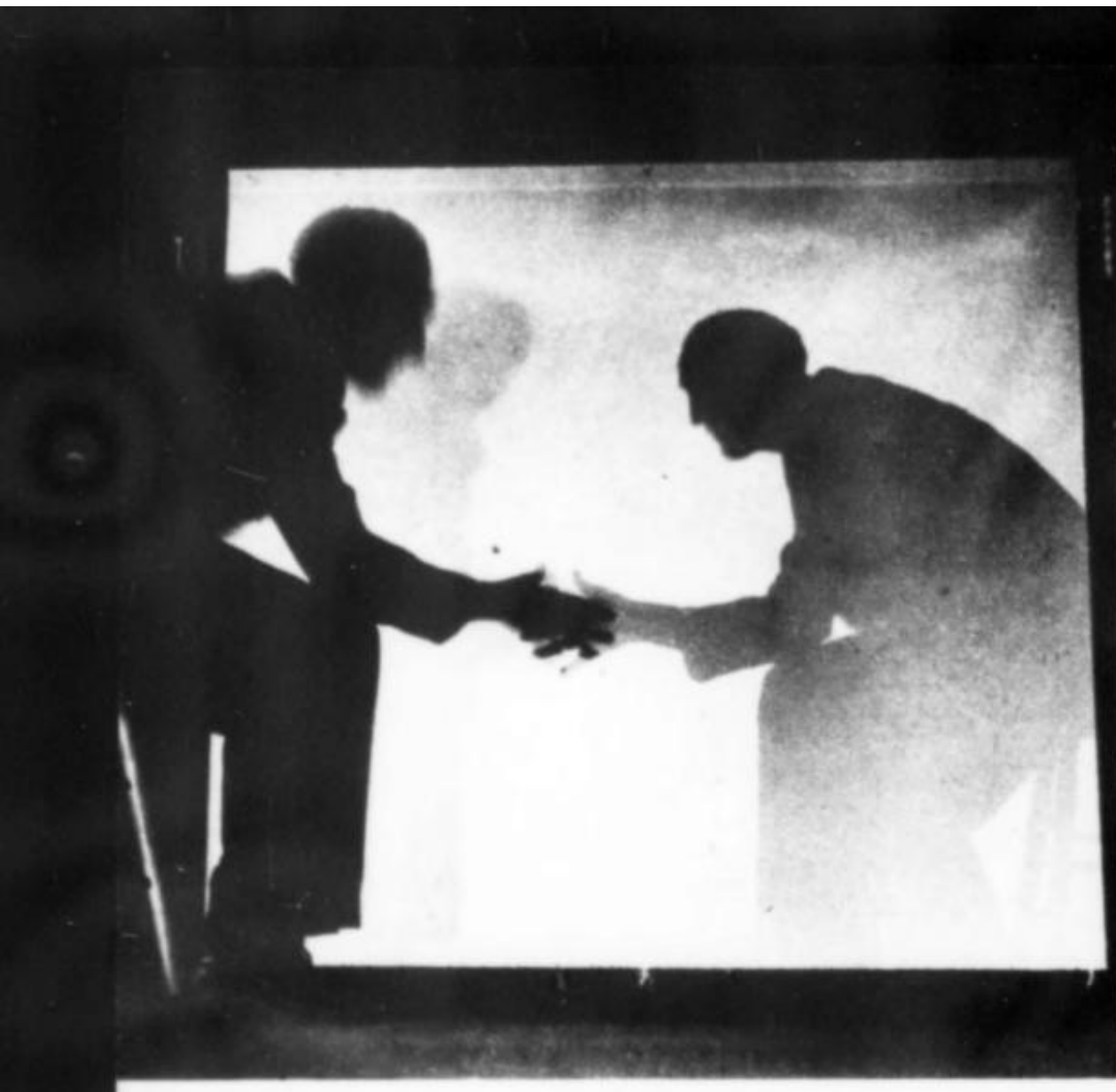
PNEUMATIC BUMPER

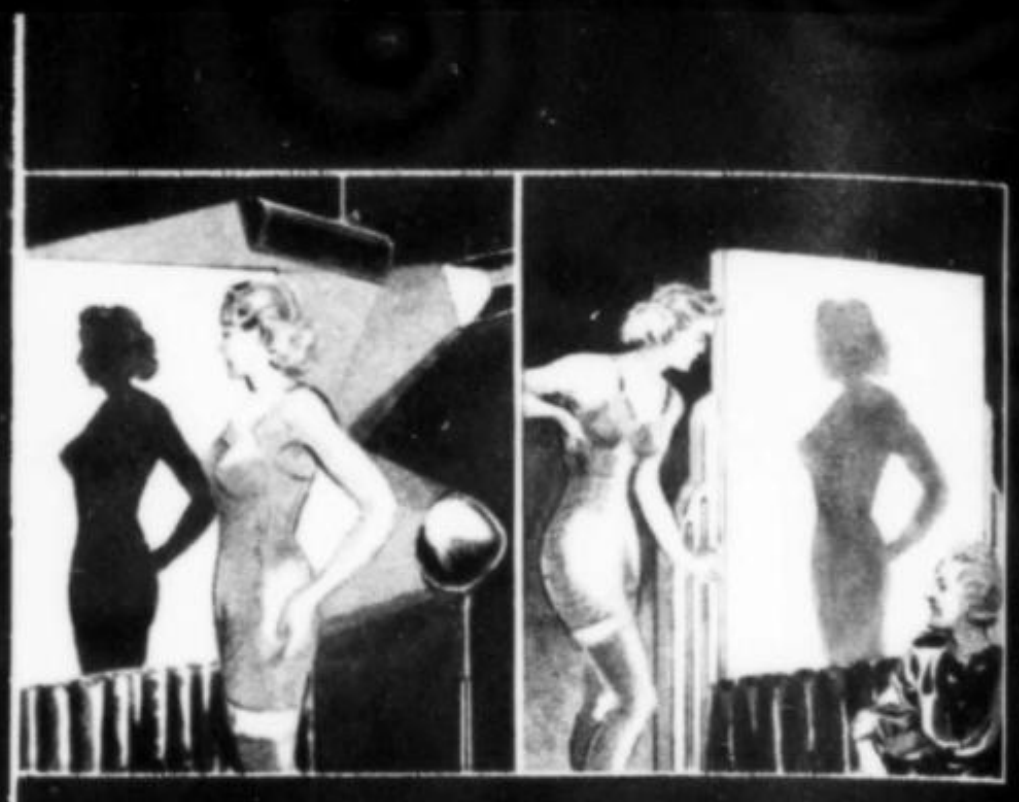
ELECTRIC MOTORS DRIVEN BY CONVERTED SUN POWER



SECTION THROUGH SOLAR-ELECTRIC HIGHWAY

Our artist's conception of the super-highway of the future, suggested by the author. Acres and acres of cells line both sides of the highway where they convert the energy of the sun into electricity which is fed to the roadway, which in turn feeds it to the cars.





Left: The author shakes hands with his own shadow, cast on the phosphorescent screen at the "House of Magic." Above is the suggestion of a woman visitor to the exhibit—using the screen so that women shoppers might see their own body profile and buy accordingly—or else walk out, highly insulted!

in the "House of Magic" suggest to me for future use, although I am not prepared to build you a sun motor for your automobile.

I think the sun motor appeals to nearly everyone's imagination. We all know that practically every bit of our energy on this world comes from solar radiation. The utilization of that energy is one of the problems of the future. We now have a motor that runs with electricity made from light. That seems to hold a rather important possibility in the future. Can't you just visualize in the world of tomorrow that we can take from the light of the sun—and not only from the light but from other solar radiations—the very power which is required to run our homes, to use in communications and in all means of transportation?

The "power plant" for our sun motor in the "House of Magic" is a small bank of photo voltaic cells. These cells convert the energy of light into electric energy. It has been pointed out that it takes perhaps an acre of so-called photo voltaic cells to convert enough sun light into energy to run even a small motor of less than one-quarter horsepower. Obviously it would be somewhat awkward to carry an acre or more of cells around with us to run our automobile.

But on the other hand, suppose that we convert all the solar radiation into electricity with cells of this type. Then we will not have to carry even a quarter of an acre of cells on our car. Instead, let's take a super-highway and plant acres and acres and acres of these cells along both sides of the highway to convert the sunlight and energy of the sun into

[*Continued on page* 128]

The late Floyd Gibbons, who first called the General Electric Research Laboratory the "House of Magic," waves his cane through the space between the electromagnetic levitator and the metal bowl which floats in the air above it.

CUT AWAY VIEW OF TRAIN AND TUNNEL

Will this be the train of tomorrow? Entirely sealed, the train will run in a vacuum tunnel, propelled at a terrific speed by a magnetic field, with practically no pressure or friction to slow it up.

SECTIONAL VIEW OF TUNNEL SHOWING TRAIN SUSPENDED IN MAGNETIC FIELD

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TAIL-FIRST PLANE TO FLY ATLANTIC IN FIVE HOURS!

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With the October issue, MECHANIX ILLUSTRATED increases its size 16 full pages, to bring you a magazine of no less than 162 interesting and informative pages—and there will be NO INCREASE in the popular price of 10 cents!

To you, our readers, who have made this increase possible through your whole-hearted acceptance of our efforts, we pledge the following platform:

Timely, exciting and informative feature articles—and plenty of them!

A larger and more varied assortment of interesting news shorts!

A bigger and better photo section for the camera fans!

A how-to-build section packed with clear-cut plans and drawings of everything from tiny kinks to boats that will weather the roughest storm!

That's our program, and we're proud of it! Our October issue, on the newsstands the 1st of September, is the Bandwagon number that you can't afford to miss!

We'll see you on board!

ROBERT HERTZBERG, Editor

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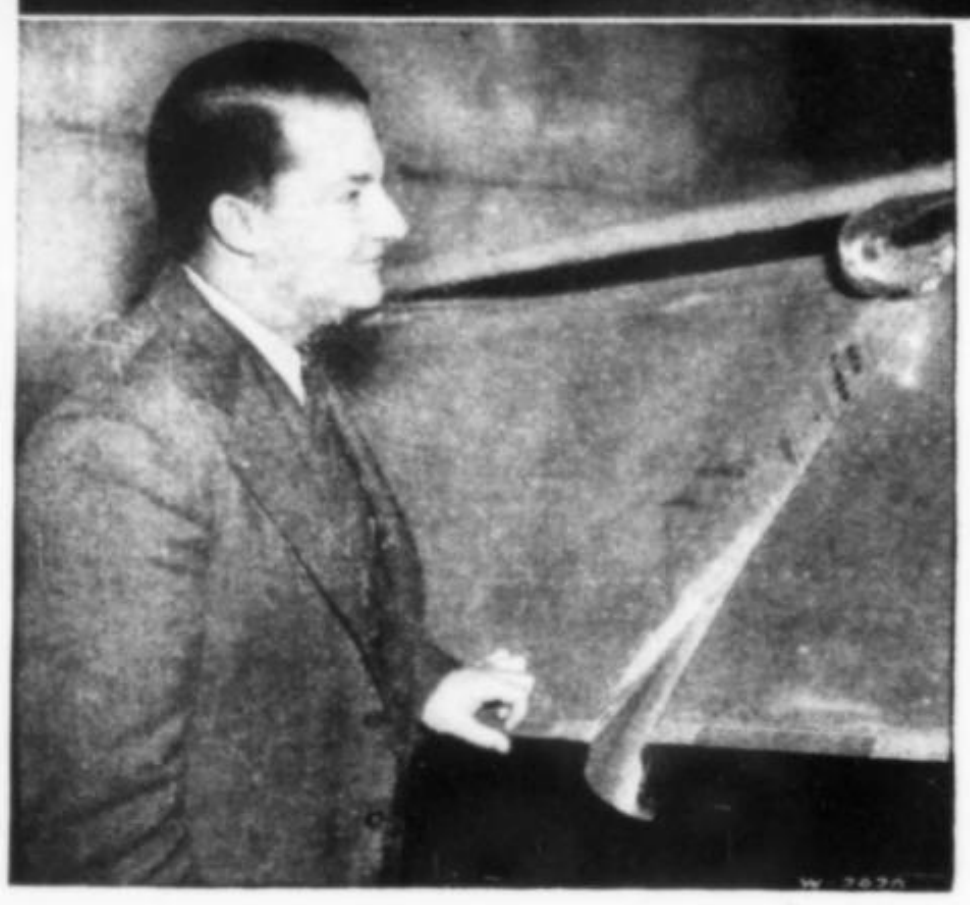
MECHANIX ILLUSTRATED

SEPTEMBER
1940

Los Angeles to London —Dawn to Dusk!



Above: Thundering over a speed course at 240 miles per hour, a huge four-engine Douglas casts a sharp shadow on the field below—promise of far greater speeds to come. Left: Clarence L. Johnson, the author, examines the Fowler flap, whose application to Lockheed airplanes won him the Sperry award in 1938.

ONE day . . . please don't ask me to fix the date . . . you will be able to step into a heavier-than-air machine in Los Angeles shortly before sunup and sleep that night in London. Fifty-six hundred miles in 10 hours! This may seem a wild Jules Verne dream at the moment, but let me ask: Who among you would have predicted when the Wright brothers flew their tail-first biplane that in 1940 we would have a military airplane capable of hitting 500 miles an hour?

Artist's conception of the interior construction of the extraordinary tail-first plane envisioned by Mr. Johnson and shown on our front cover as it prepares for a landing. Combination gasoline-steam engines will provide a total of 12,000 horse power for this revolutionary sky-bullet!

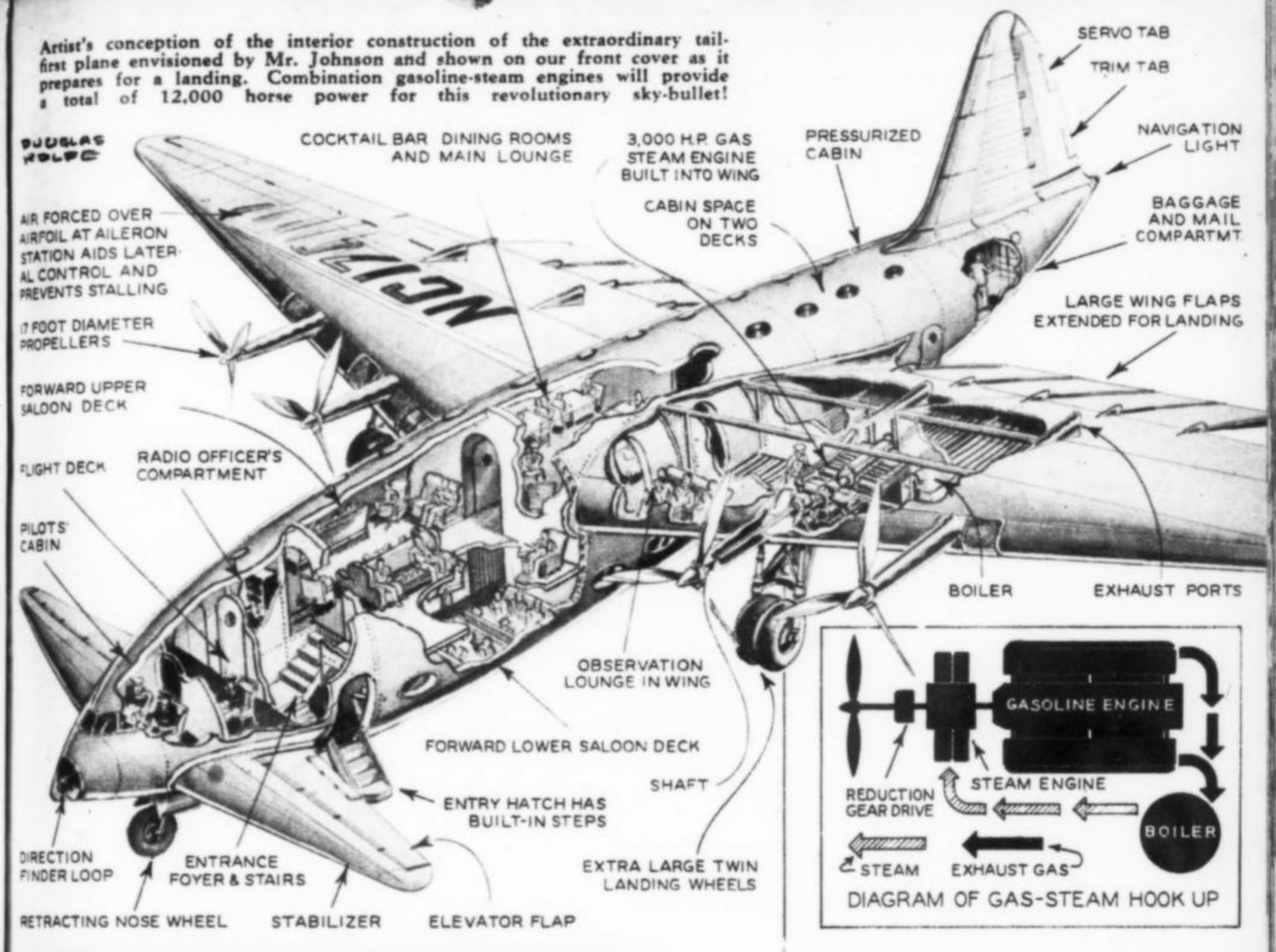


DIAGRAM OF GAS-STEAM HOOK UP

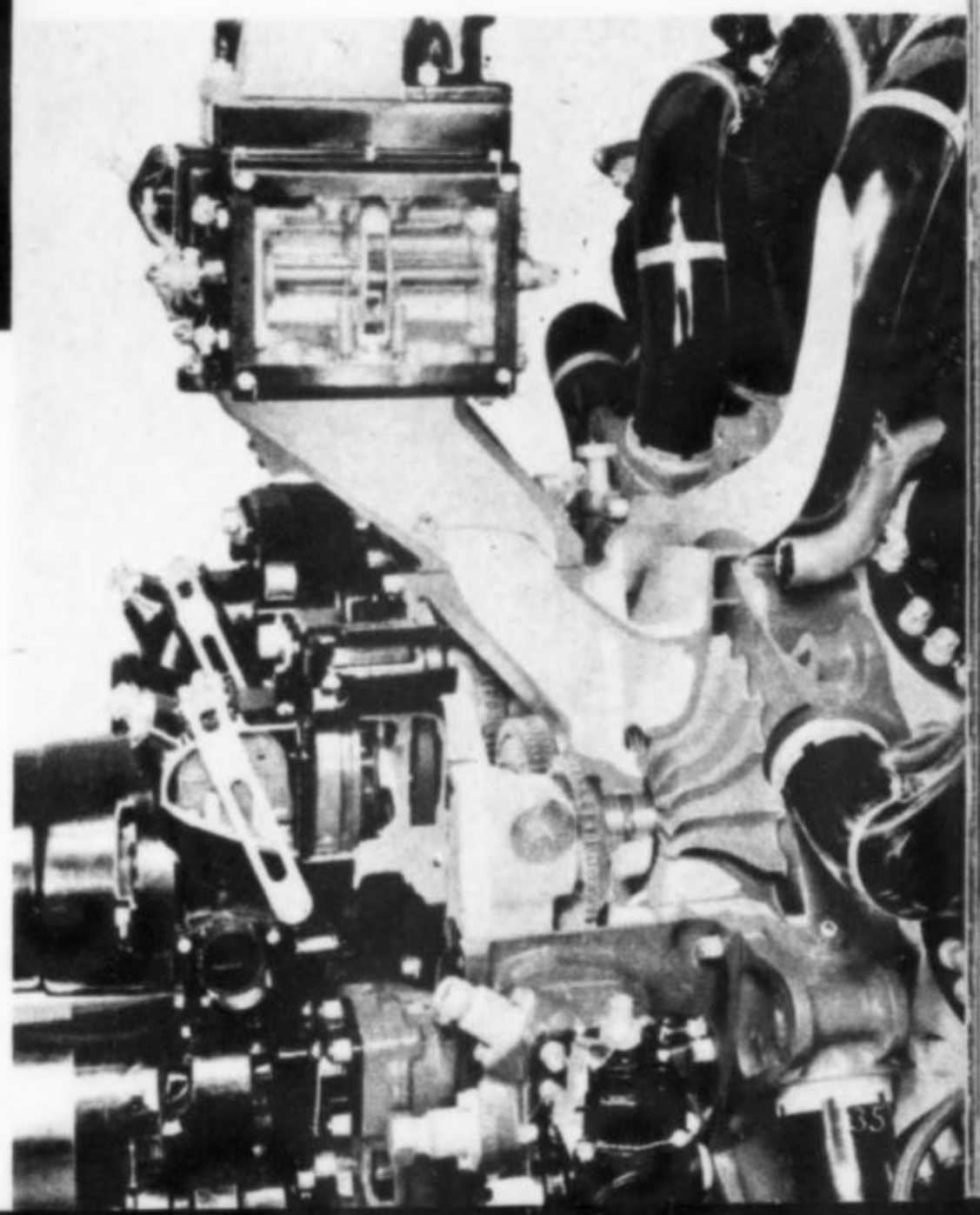
by Clarence L. Johnson

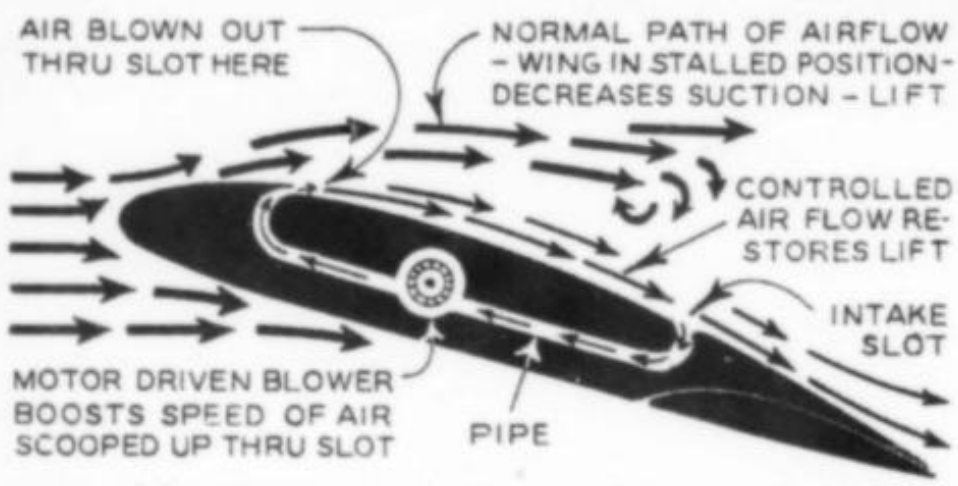
Chief Research Engineer,
Lockheed Aircraft Corporation

Who says that a tail-first plane with a speed of 560 miles per hour is already taking shape in the minds of practical aeronautical designers.

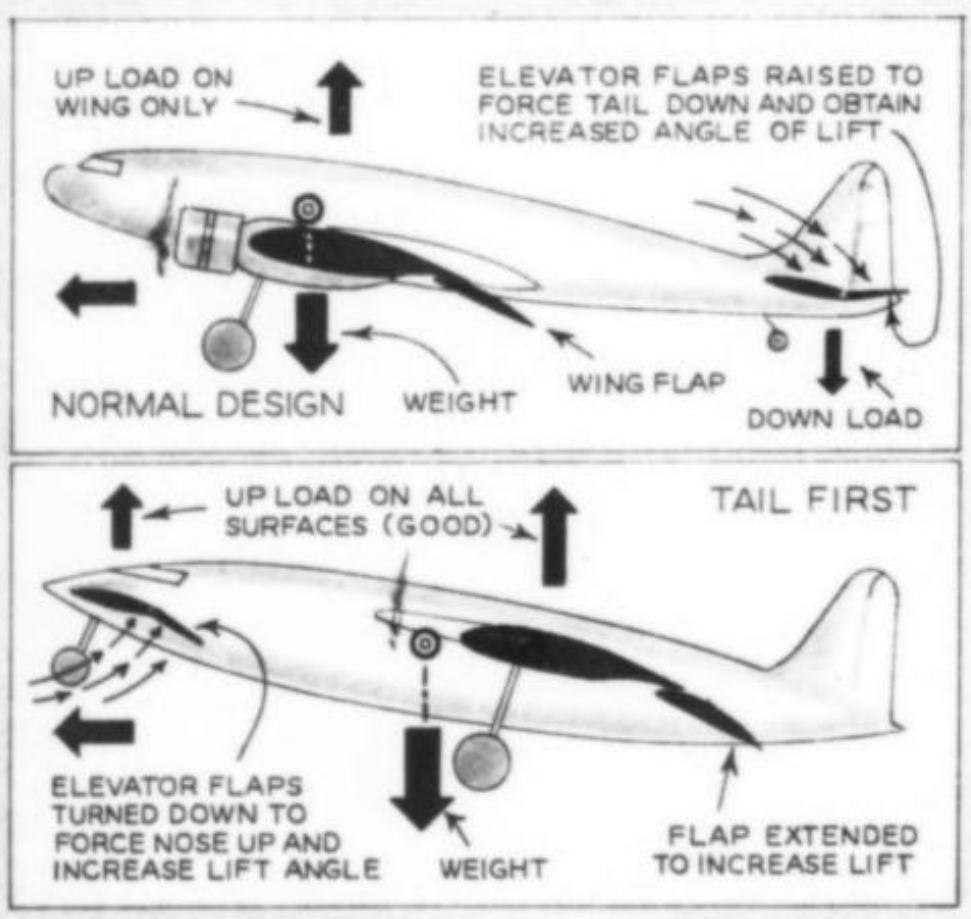
Not only have we achieved undreamed speeds with ever increasing safety, but we are returning to first principles. In the not-too-distant future, you will witness giant transports winging their way tail-first across the continent, then across the Atlantic, then from the Pacific coast of the United States to Britain's capital in a half-day. From these swift ships we may see planes evolve gradually into powerful rockets, climbing swiftly to high altitudes and carrying their passengers at great speeds, perhaps faster than the present apparent limit of 746 miles an hour (the speed of sound) and setting them down gently on distant airports with even greater safety than man flies today. And the safety

Below: This close-up of a cutaway section of a Wright Cycline 1000 h. p. engine gives some idea of the complexity of an airplane's power plant. Yet Mr. Johnson says that we will soon have engines of three times this size, to push the transports of the future at speeds approaching that of sound itself!





HOW BOUNDARY LAYER CONTROL WILL WORK



HOW TAIL FIRST DESIGN SCORES IN LANDING

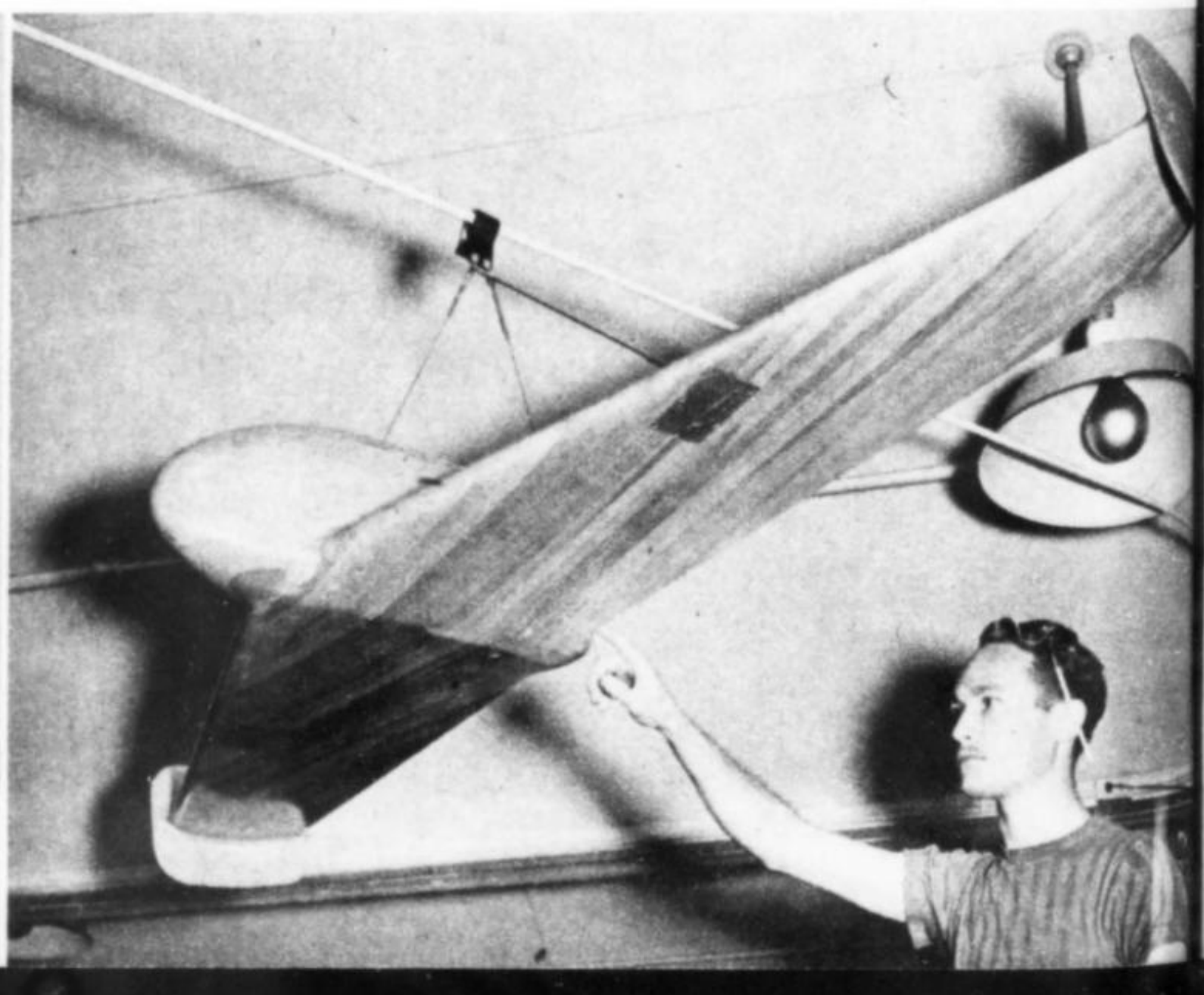
* NOTE UNEQUAL DISTRIBUTION OF FORCES AND GREATLY INCREASED DOWN LOAD ON TAIL OF NORMAL TYPE SHIP

record of American transport operators, I might add, already amazes skeptics who look upon airplanes as dangerous instruments.

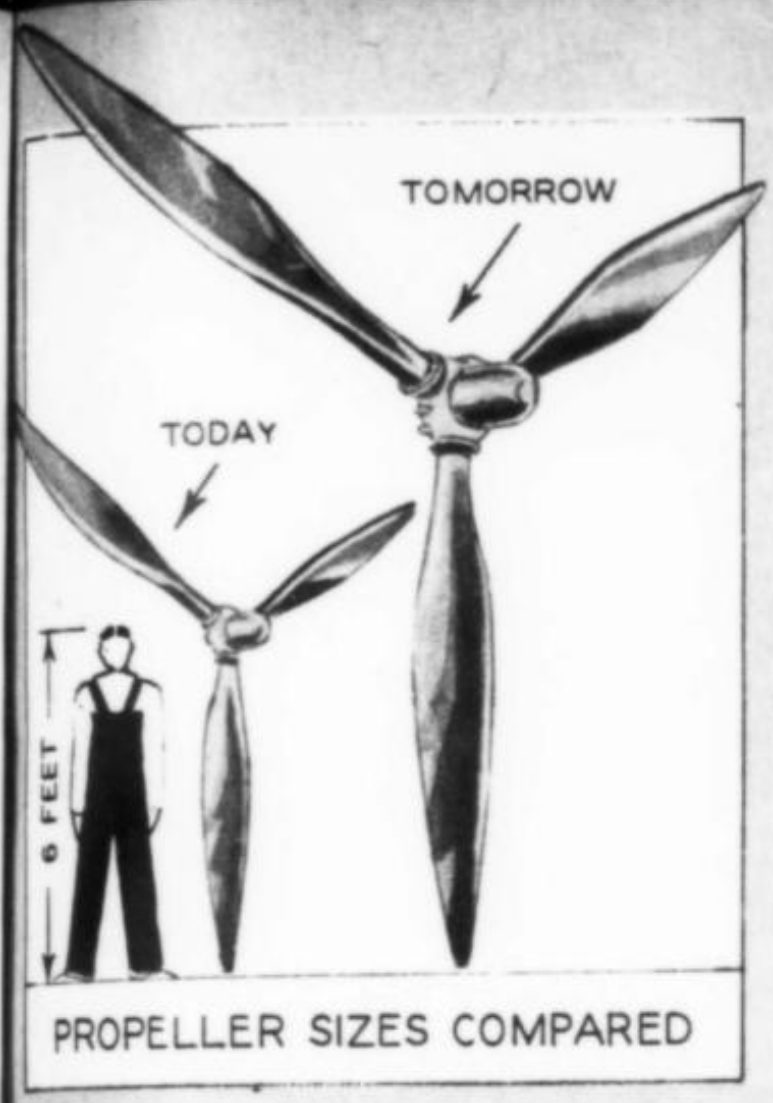
We know the form airplanes will take during the next eight to ten years, for they already are on the drawing boards. Some of these plans envision amazing changes. In certain designs, the tail will be moved from the rear to the front. Engines will push instead of pull. You will see six smaller rather than four larger motors turning three -and four-bladed propellers. Combination gasoline-steam engines may develop from plans now in existence. Ingenious methods for controlling the boundary layer of air around the wings, thus diminishing resistance and adding many miles to a plane's speed, will come. And, perhaps more startling than any of these things, air travellers eventually will ride in airplanes having a wing loading of 300 pounds per square foot!

Hundreds of tests have been made during recent years, investigating the effect of wing loading on transport design. The wing loading, I should explain, represents the total gross weight of an airplane divided by the wing area; it is a measure of the actual load each square foot carries during normal flight. Wing loading affects the flight characteristics of the airplane in that the higher the loading per square foot, the higher the speed at which the craft must fly to carry the load, or the greater must be the angle of attack at which the wing meets the air.

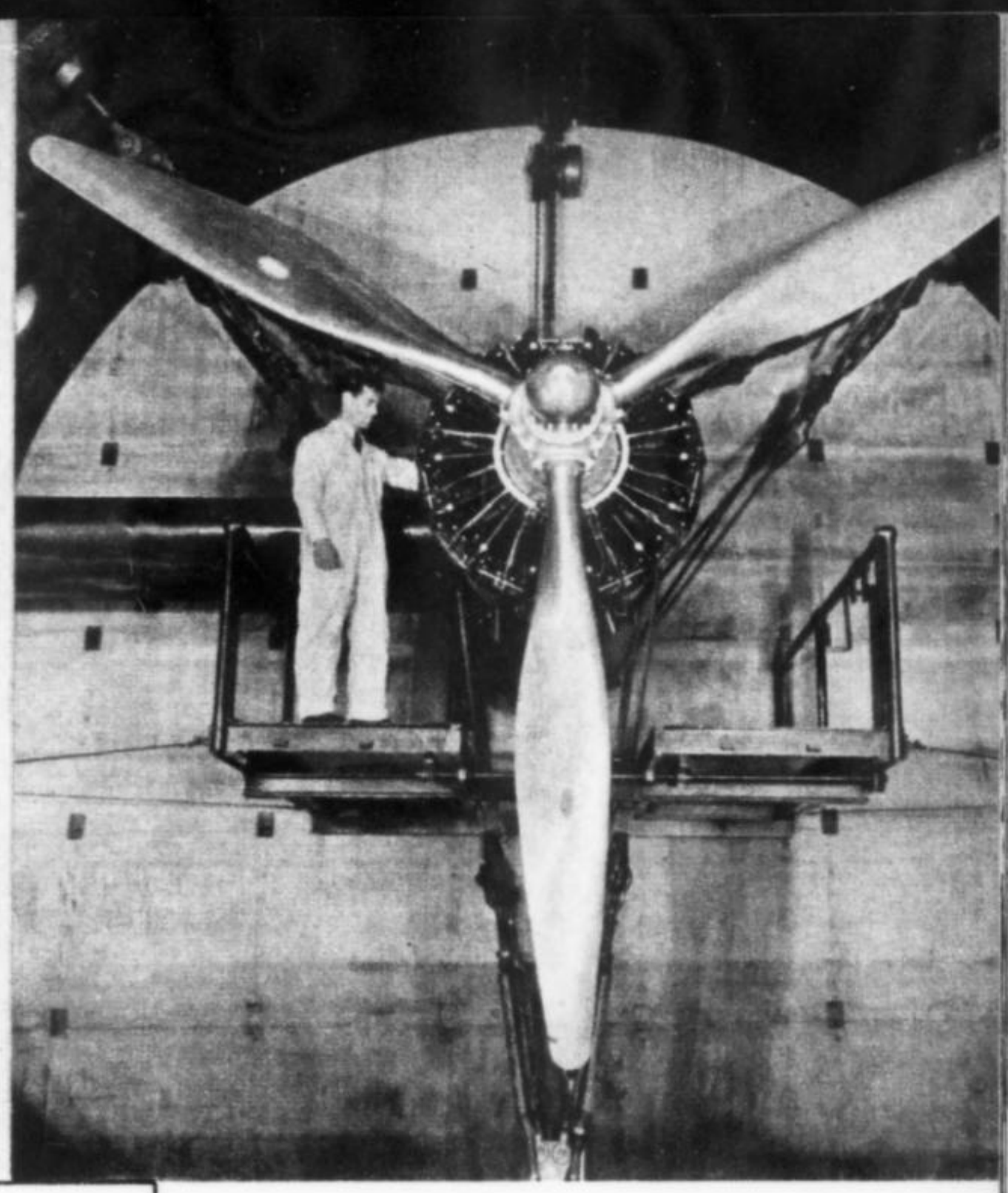
What does a 300-pound wing loading mean? This tremendous value will be appreciated



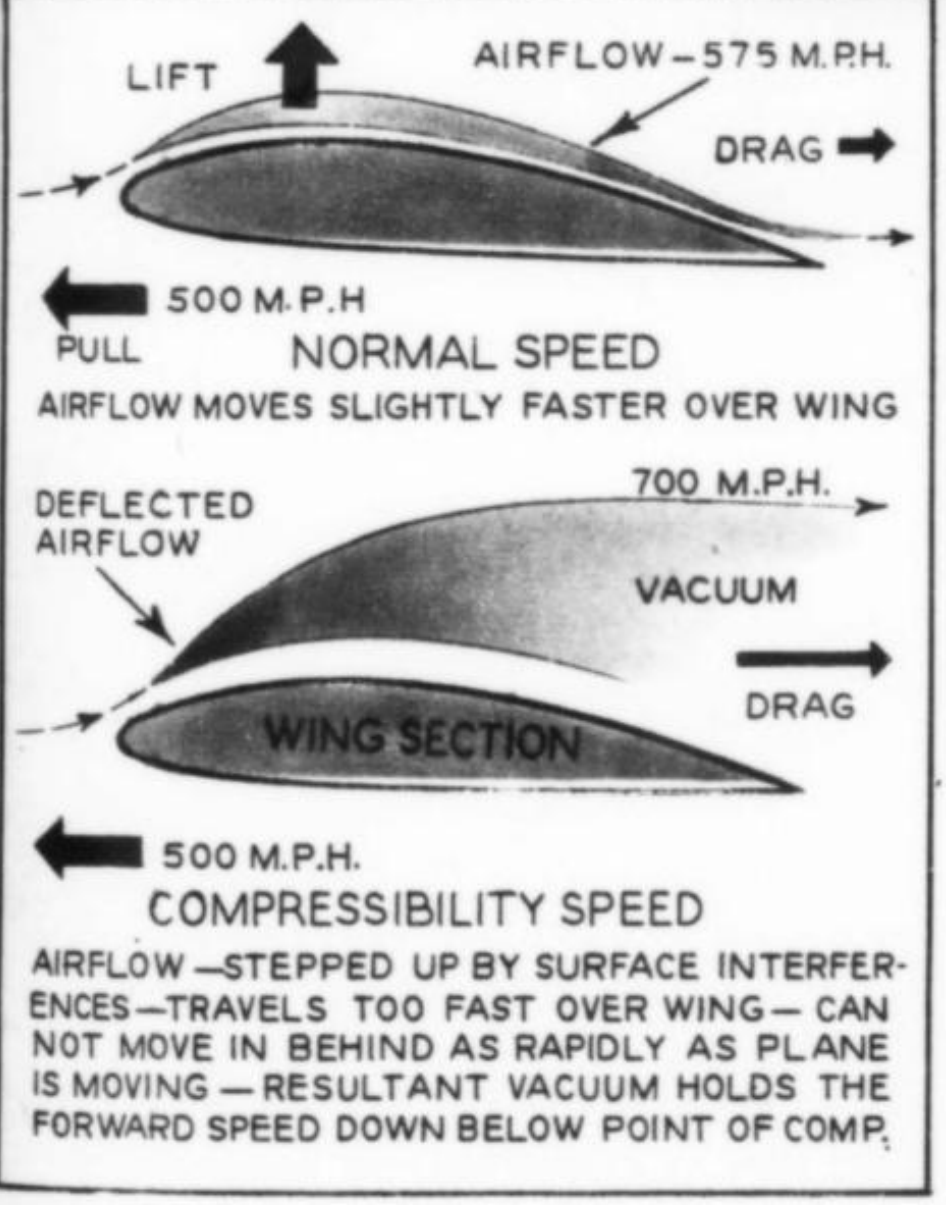
Right: Model of a "flying wing" developed by Lockheed engineers. Note the vertical control surfaces at the wing tips and the complete absence of conventional body structure. This design has been the subject of much discussion, but it is not likely to leave the drawing-board stage for some time yet because experiments indicate the need for an additional stabilizing medium either in front or behind.



PROPELLER SIZES COMPARED



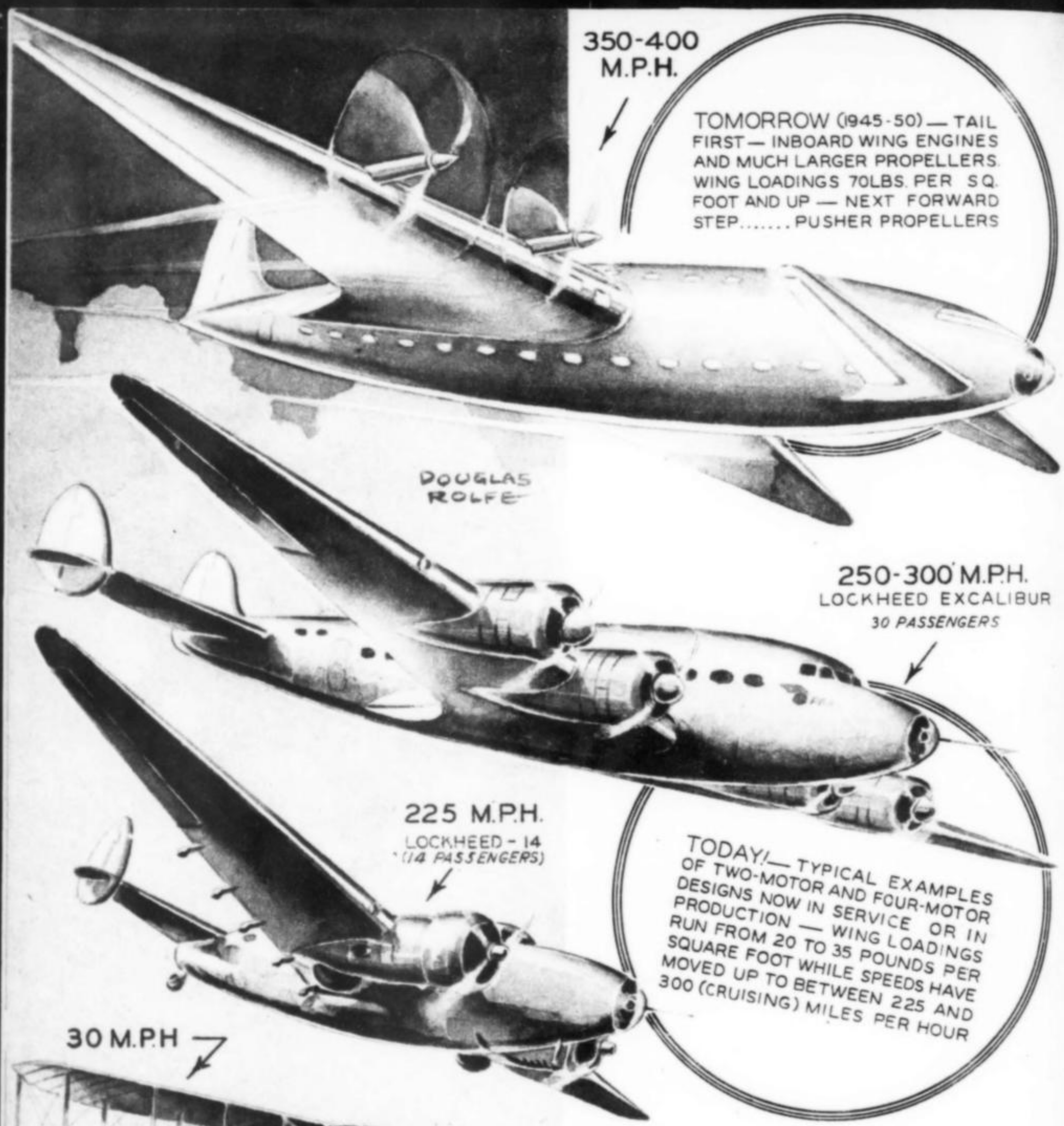
Bigger airplanes need bigger engines and bigger engines need bigger propellers. The photo on the right shows the Hamilton 17-foot giant, designed for power plants up to 2400 h.p. The engine in this picture is a 1200-h.p. Twin Wasp; note how it is dwarfed by the propeller itself.



better when you recall that birds and powerless gliders soar on a wing loading of about three pounds; typical transport plane loadings vary from twenty to thirty-five pounds. When we multiply today's loading nine to fifteen times, we must use smaller wings, engines of greater power and fly at much faster speeds. These conclusions are inescapable.

High-lift flaps developed in recent years facilitate the maneuvering of an airplane with high wing loading during takeoff and landing, which tells us we can land these fast ships at speeds only a few miles faster than is practiced today with transports of all types. In a short time power from the engines will be used to control the flow of air around the wing in such a manner that even the minimum speed factor will be a function of power.

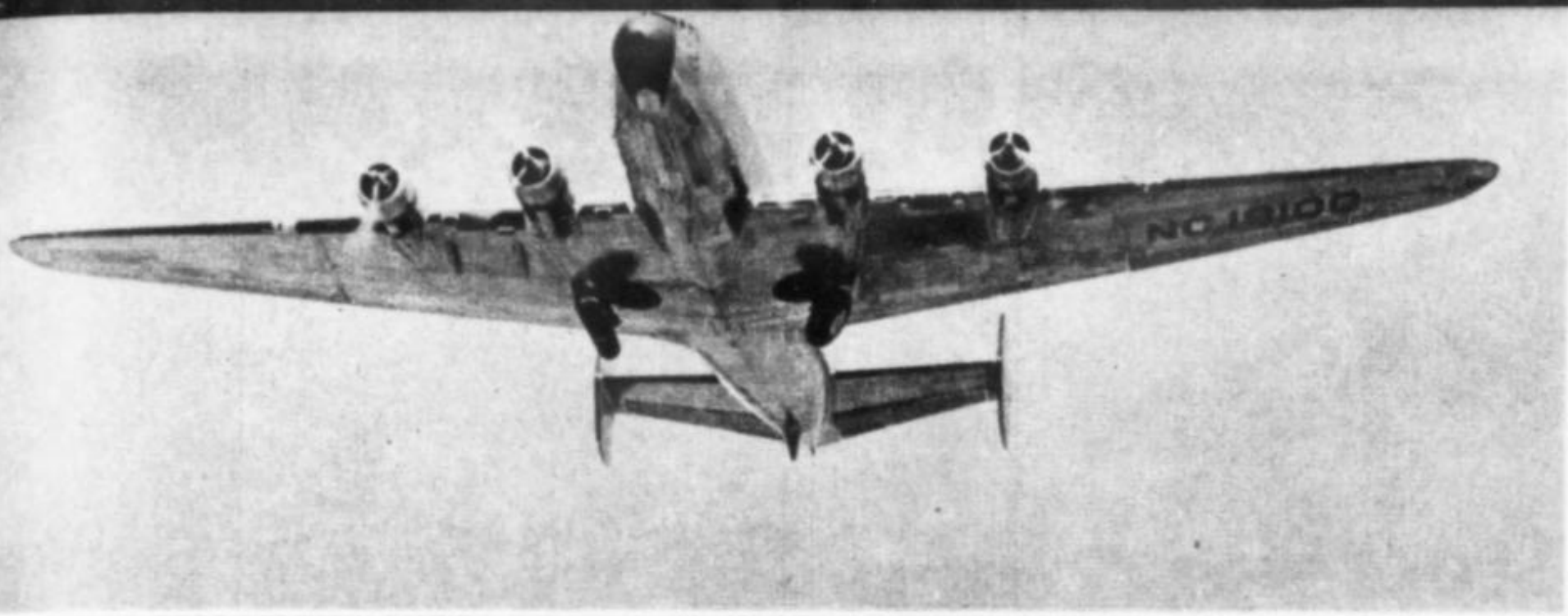
Let me tell you about this amazing development, because boundary layer control probably will make it possible for engineers to increase wing loading to 70 pounds per square foot within the next five years. When a wing moves forward, the air forms invisible patterns along its surface, the amount and type of turbulence depending upon the form and thickness of the wing, the velocity and other factors. By placing an intake slot near the trailing edge and scooping up some of the air, piping it forward and blowing it out again near the leading edge, we shall be able to attain a high degree of lateral control and thus avoid normal wing stalling. High-lift

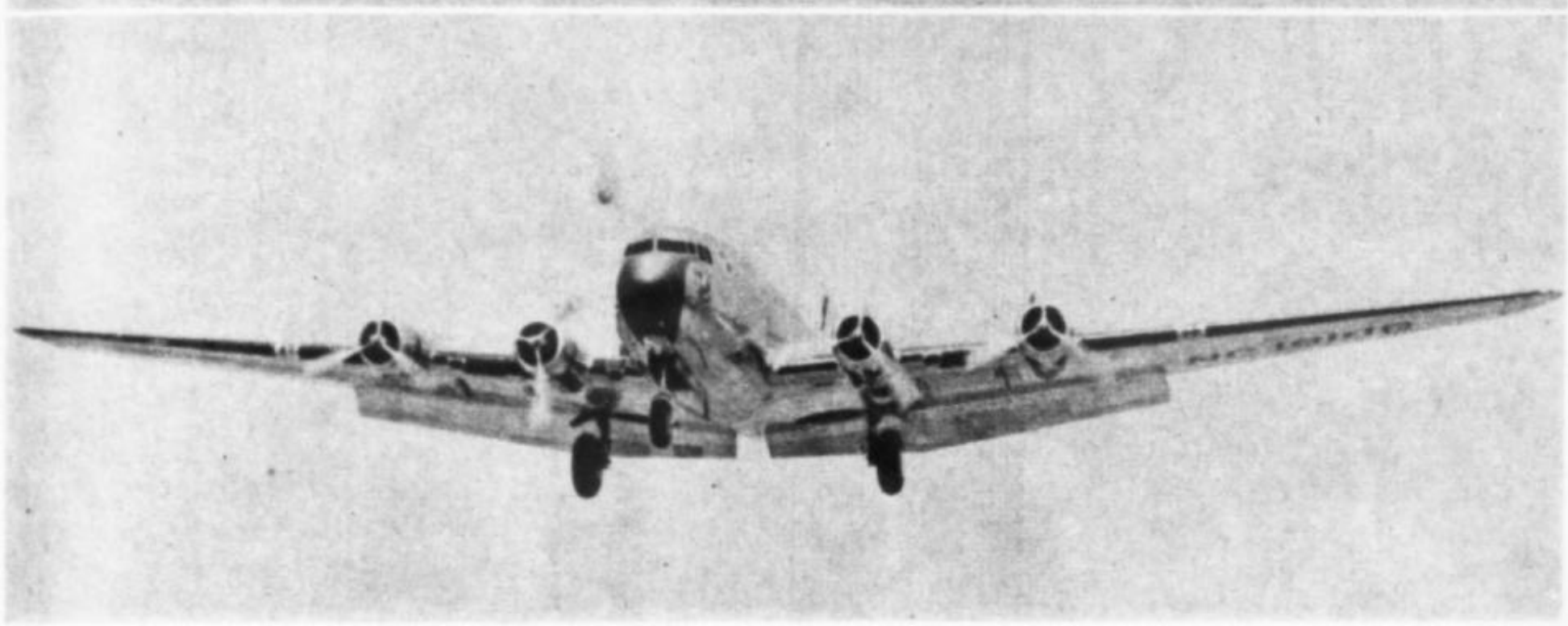


The ascending scale of passenger airplane performance is protrayed here, starting with the original Wright biplane. The more immediate possibilities for the future as described by Mr. Johnson are illustrated at the head of the page. After this will come pusher-type propellers, thus completing the reversion to the Wright brothers' conception of aerodynamic design; much later, we will have the "flying wing."

flaps at the trailing edge will give further control. Together, these devices will bring into use a highly tapered wing. As another possibility, control of the boundary layer also will make possible use of thinner wings of very efficient air-splitting design.

You no doubt have read incredulous stories about forthcoming rocket trips to the moon and other planets outside the atmosphere of this earth. Engineers, supposed to be hard-headed and practical, give little thought to these proposed flights into the outer vacuum. Some of us do visualize the day when rocket ships will be carrying passengers, mail and express around this globe. But we must hurdle a number of more immediate obstacles before we reach the rocket stage.





These are pictures of the same airplane, but how different they look! The top photo shows a Douglas DC-4 just after take-off. The forward wheel of the tricycle landing gear is already folded up in the nose and the other two wheels are about half way up. The ship is pointed up and is seeking altitude. The lower picture shows the plane almost leveled off for a landing. The wheels are down in position and the landing flaps are fully lowered. The size of these flaps isn't generally appreciated, as few people are able to watch the landing of this plane from the same position that this picture was taken.

What of the next ten years? First, we're going to achieve greater safety with the Lockheed Excalibur, the Douglas DC-4 and the Boeing Stratoliner, all of which will reach various airlines during coming months. Present transports utilize about 75 per cent of their engine power at cruising speed. The new types will operate normally at half-power, leaving a mighty reserve available at a touch of the throttles for taking off, climbing and other maneuvers.

Following these ships, we'll move on to another series employing engines of 2500-3000 horsepower each, so efficiently designed they will hit close to 400 miles an hour (top speed) at an altitude of five miles. These planes will weigh from 75,000 to 100,000 pounds. About that time, we may move the tail surfaces, now conventionally at the rear, forward near the nose.

Why do we plan this seemingly daring innovation?

In landing with flaps down, a routine procedure, the pilot forces the tail down until the plane assumes a high angle attitude for maximum lift. This adds enormously to the down load on the tail while applying an up load on the wing. By placing the tail ahead, we obtain an up load on both the tail and wing. Thus we lift the entire structure, no longer working against ourselves as at present.

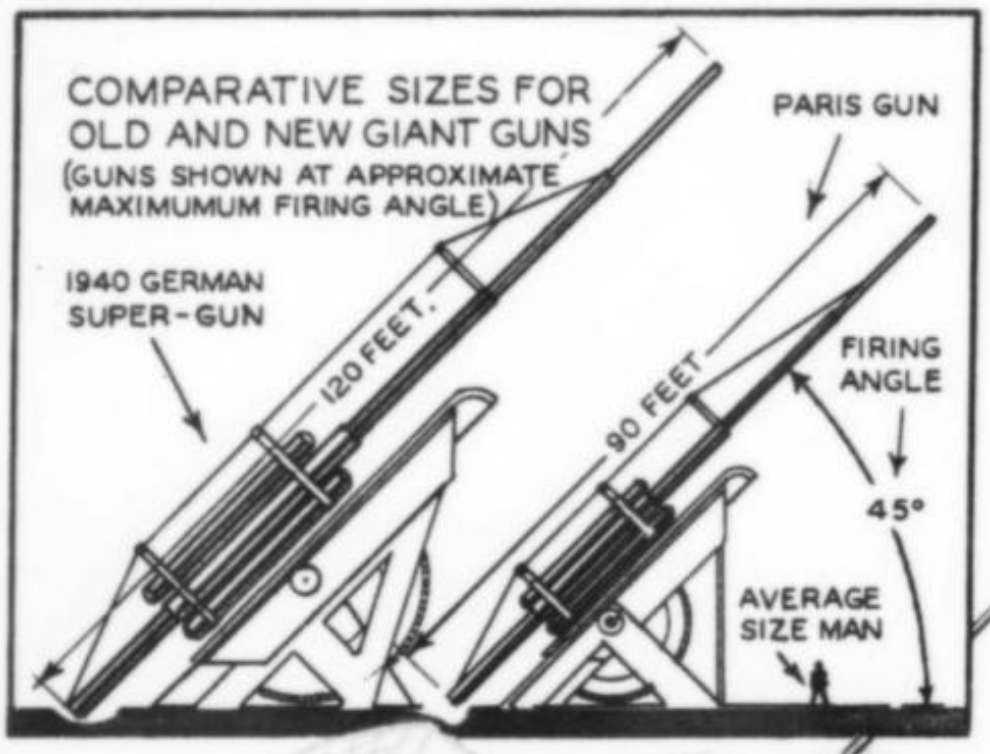
This brings us back to the Wright brothers' original idea, which we long have known to be aerodynamically sound but for other practical reasons have avoided.

Earlier I mentioned engine power. Such predictions cannot be made without some qualification, because we do not yet know definitely whether four larger or six smaller propellers will prove more efficient for an overall design. In any event, by 1945 we will have in service transports operating at 350 miles an hour, flying five miles up, passengers comfortable in pressurized cabins. These planes will fly on wings stretching 175 feet from tip to tip, will weigh 135,000 pounds and have a wing loading of 55 pounds. We're moving up already!

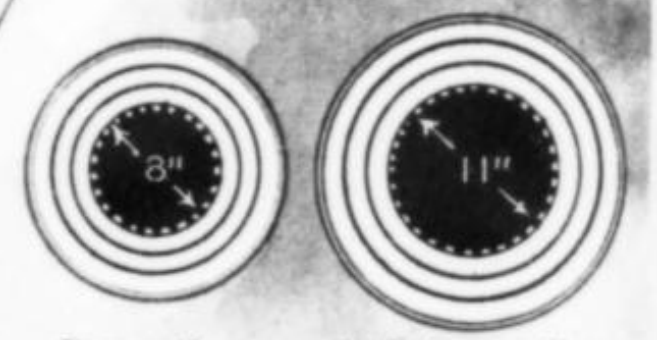
By that time, we'll be installing engines of

[*Continued on page* 128]

ARE THESE GERMANY'S



PROJECTILE LEAVES GUN AT A STATED MUZZLE VELOCITY OF 6,000 FT. PER SECOND — MORE THAN 4,000 MILES PER HOUR /



PARIS GUN 1940 SUPER-GUN

COMPARATIVE CALIBERS (BORE) OF OLD AND NEW GIANT GUNS

MAP SHOWING AREAS MENACED BY 135 MILE RANGE SUPER-GUN

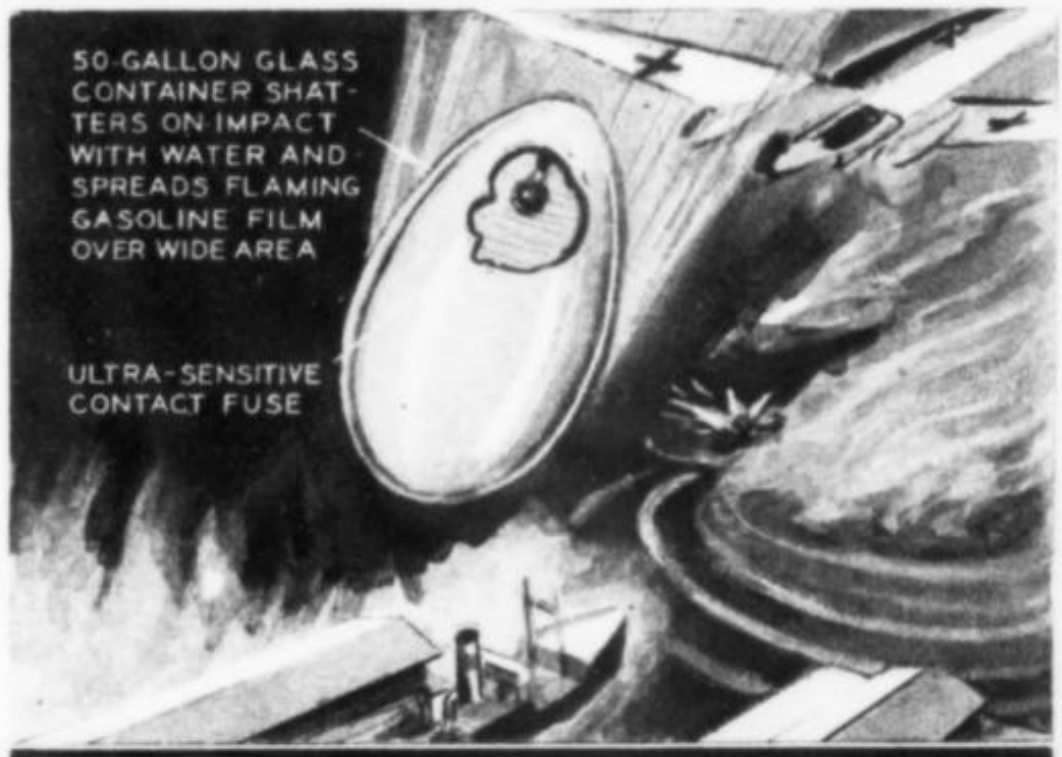
GERMANY'S alleged super-cannon, reported to be ready to shell London from the captured Channel coast, arouse less incredulity now than their ancestors that shelled Paris at 75-mile ranges did when they opened fire in 1918.

Soldiers as a rule do not advertise their intentions in advance, but there is nothing really incredible about the reported dimensions of the new guns, especially when one compares them with those of

SECRET WAR WEAPONS?

Entire tractors and other heavy farming and mining machines are regular cargo in commercial planes now in service in Canada and South America, so it is not at all unreasonable to expect four-engined military ships of special design to carry full-sized tanks and cradles under the fuselage. Since the jump across the English Channel is a very short one, only a small gasoline supply would be needed for the trip.

COMPARATIVE SIZE — TANK - PLANE AND FIGHTER



GLASS BOMBS FOR ASSAULT ON DOCK AREAS

the long-range Paris guns of 22 years ago. The Paris guns were about 90 feet long for a caliber of about 8.3 inches; the new ones, said to have a length of 120 feet and a caliber of 11 inches, are fairly in proportion. It is quite within the bounds of probability that the Germans could build pieces of this size; the 1918 model was half an improvisation, made by inserting a long inner tube into an

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A FAWCETT MAGAZI

APRIL
15c

NAZI "SECRET WEAPON"
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UR LAST CHANCE TO ENTER
HE 4TH ANNUAL WORD GAME
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MECHANIX ILLUSTRATED

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On the cover: German Rocket Gun, MECHANIX ILLUSTRATED design by Adolf Treidler

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THE "SQUIRT"

by Willy Ley

The propellerless, jet-propulsion plane sucks in air, heats it, pushes it into a compressor. There it mixes with burning fuel, building up pressure. Gases escaping through a nozzle create the jet.

Talking about secret weapons, here's one for our side—the sensational new "Squirt." British-designed plane that's heaved forward by an exhaust-gas jet. Already the plane-without-propellers is being turned out by Bell Aircraft in this country, powered by General Electric engines. Here's the lowdown on how the ship works, by MI's rocket expert.

HARD on the heels of the Nazi Propaganda Ministry's announcement to the world about Hitler's new and terrible secret weapons, the Allies disclosed one of their own: a jet-propelled airplane originally developed in England by Group Captain Frank Whittle of the RAF.

It is doubtful whether this release was deliberately timed to counteract whatever small measure of success the German propa-

ganda may have had. It was stated by British sources that the secret had to come out simply because it was not a real secret any longer, too many people having seen the "Squirt," as they called it, during test flights.

Captain Whittle's Squirt is not the first jet-propelled plane, but it is the first which can be called successful. The first jet-propelled plane which attracted attention was an Italian design, worked out by an Italian engineer by the name of Secondo Campini and built by the firm of Caproni. Since it was the second model of its kind it was called the CC-2. This CC-2 made a much publicized flight from an airdrome near Milan to an airdrome near Rome in December, 1941. The distance is around 170 miles, and the average speed attained by the plane was about 90 m.p.h. The pilot had to land at Pisa for the rumored purpose of refuelling.

The British, when they heard about this—and the few Americans then "in the know"—must have smiled. By that time the Squirt had already made its first successful flight. No performance data on the first flight are available, nor has it been stated just how fast the present model can go, but British observers have said that the Squirt "makes Spitfires seem slow" and have estimated its speed at about 600 m.p.h.

It was later revealed that the first American model had been built by Bell Aircraft, with engines built by General Electric. To this general information the more specific information was added that the plane resembles the P-38 Lockheed Lightning in general appearance and that it runs on kerosene. If you add to this the admission of very high fuel consumption, the report that British civilians at first fled into shelters during test flights because they thought the noise was caused by a large bomb, and the statement made by various airmen that an experienced pilot should have no trouble at all flying the Squirt, you know everything that a civilian should know about it at the present time.

About the engine of the Squirt it has only been stated that it consists in the main of an air compressor and a turbine. We can be fairly certain that there have been modifications since the description of the engine was published, but the general principle seems to have remained the same.

Yes, a description of the early version of Captain Whittle's jet-engine has been published in print. As early as 1938 it was discussed in the German magazine Flugsport and a description appeared, together with a detailed diagram, in September, 1941 in the British magazine Flight.

This description shows clearly why the Squirt is so much more successful than the CC-2. In the CC-2 the process was as follows: the air was sucked in through the open nose of the fuselage, passed a radial engine mounted inside the fuselage and was then compressed by a two-stage rotary compressor, turned by the radial engine. Then thin streams of fuel were jetted into the compressed air and ignited. The jet consisted of the products of the combustion, plus a large amount of surplus air, plus the exhaust of the radial engine. The machinery took up the entire fuselage so that the cabin for the pilot had to be perched on top of it.

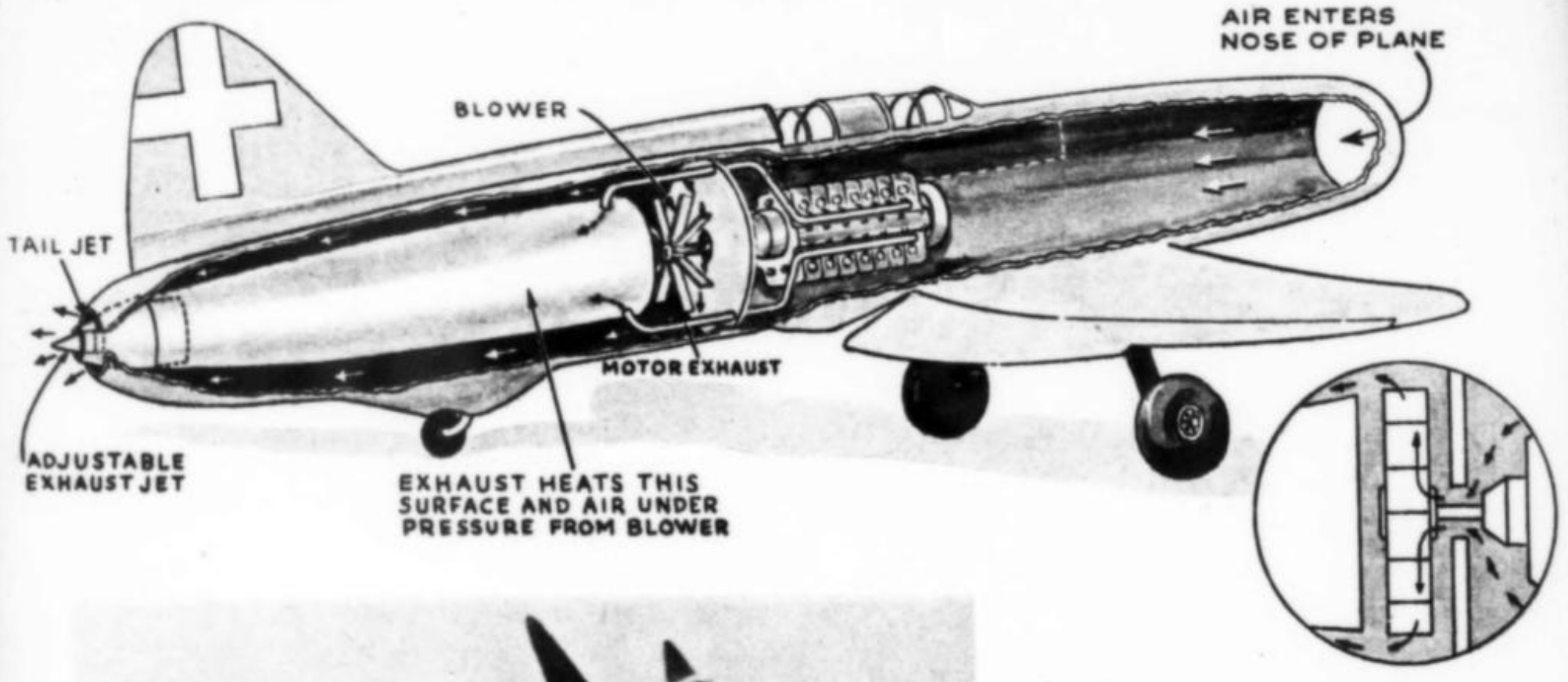
In the first Whittle system the procedure was much simpler. The air was sucked in and compressed by a compressor built along the same lines as a supercharger. This fed it into a wide air duct into which fuel was injected and ignited. The rapidly expanding (because hot) stream of combustion products and air then turned a turbine wheel. It was this turbine which furnished the power for the compressor. The stream of hot gases and air does lose some energy in the process, but even after passing the turbine it still produces a powerful jet. And it is this jet which propels the plane.

It is interesting to note that each one of the component parts is well known to engineering science. Captain Whittle's merit consists in combining these parts properly and in making them behave as theory said they might, but as many experts suspected they would not.

There is a great deal of confusion between jet propulsion and rocket propulsion. The underlying reason for this confusion is, of course, that a rocket produces a jet too. As a matter of fact both are alike as far as the "outside" functioning is concerned. Both move by the reaction of a jet.

The difference is the nature of the jet. In a true rocket, such as, for example, the shell of the bazooka, the jet or, better, the exhaust blast, consists solely of the combustion products of the fuel—in the case of a bazooka shell, of the gases generated by burning the powder of the propelling charge. A jet, as used in jet airplanes, consists mainly of atmospheric air which has been heated by the combustion of some fuel. Of course the combustion products are mixed in in the process.

It is also interesting to note, and it should,



First jet plane to hit the headlines was the CC-2, built by Caproni-Campini in Italy. It hit 90 m.p.h. during 1941 tests, then speedily vanished. But by then the Squirt had proved its worth.

perhaps, be emphasized, that every airplane is, in effect, a jet-propelled plane. In every airplane the propeller gathers up large masses of atmospheric air and throws them back, thus creating a jet which propels the plane. The difference is, in the first place, one of method. The "jet" of a propeller plane flows around the fuselage or engine nacelles, while in the jet system the air flows through the mechanism that produces it. In the second place the temperature of the air used in the propeller system is virtually unchanged, while in the jet system the air is deliberately heated to make it expand and leave the exhaust nozzle faster.

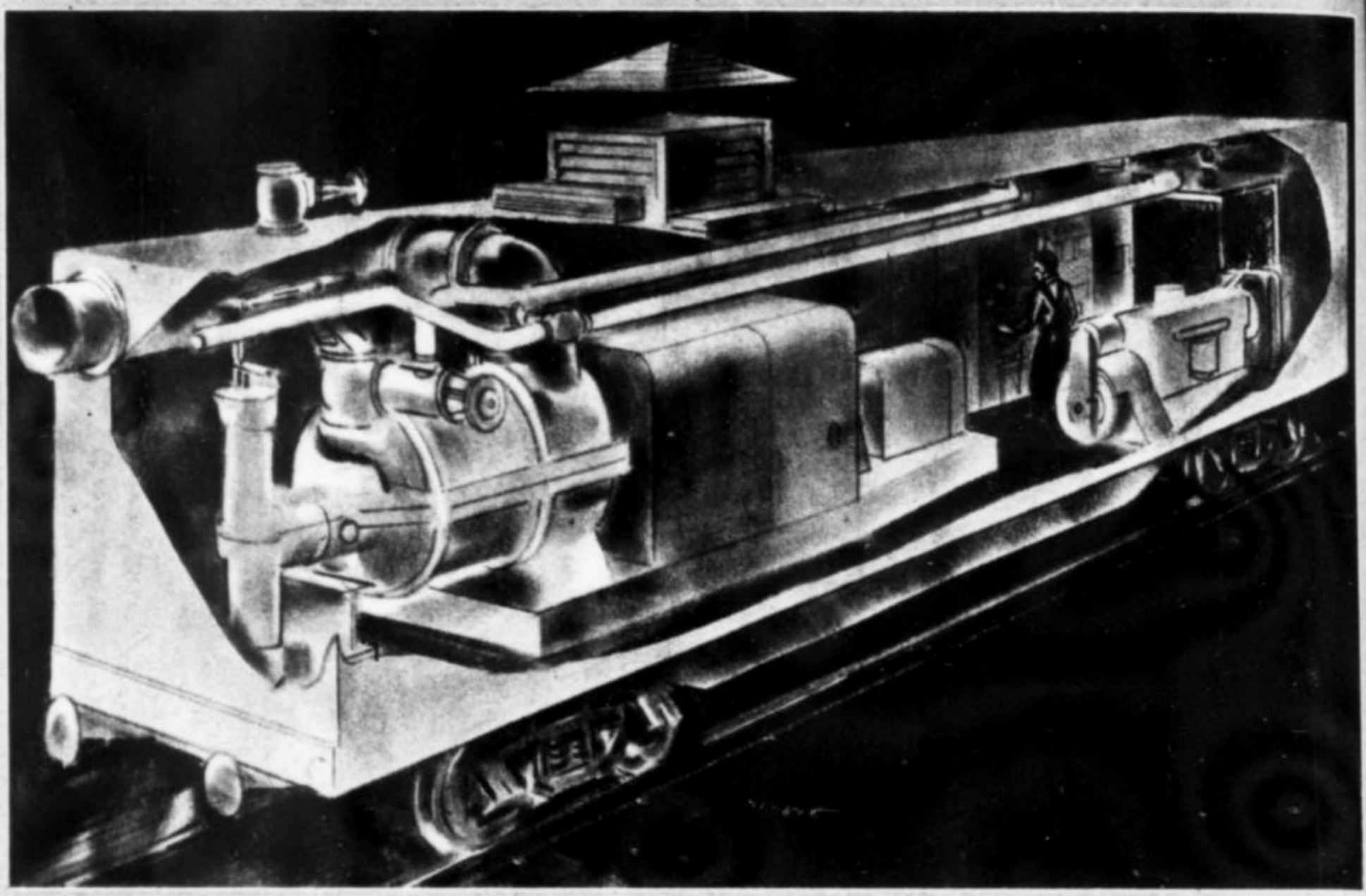
The result is that the "jet" of a propeller plane is by far slower than the jet which emerges from the exhaust nozzle of a jet plane. It might also be claimed as an advantage for the jet system that the mechanism is much simpler (at least in the Whittle system; it certainly wasn't in the Campini system) and that the turbine jet plane will eat almost any kind of fuel (it probably could be made to run on powdered coal) while the highly developed internal combustion engine needs gasoline with a high octane rating.

But the main question is really what the faster jet will do for the plane. The obvious answer is that it will produce a higher speed. In fact, unless the speed is higher than that of even the fastest present day propeller airplanes the efficiency becomes so low that the whole change is not only useless but a definite drawback. There is no such thing as a low-speed jet-propelled plane.

Now a high speed can almost always be classified as an advantage.

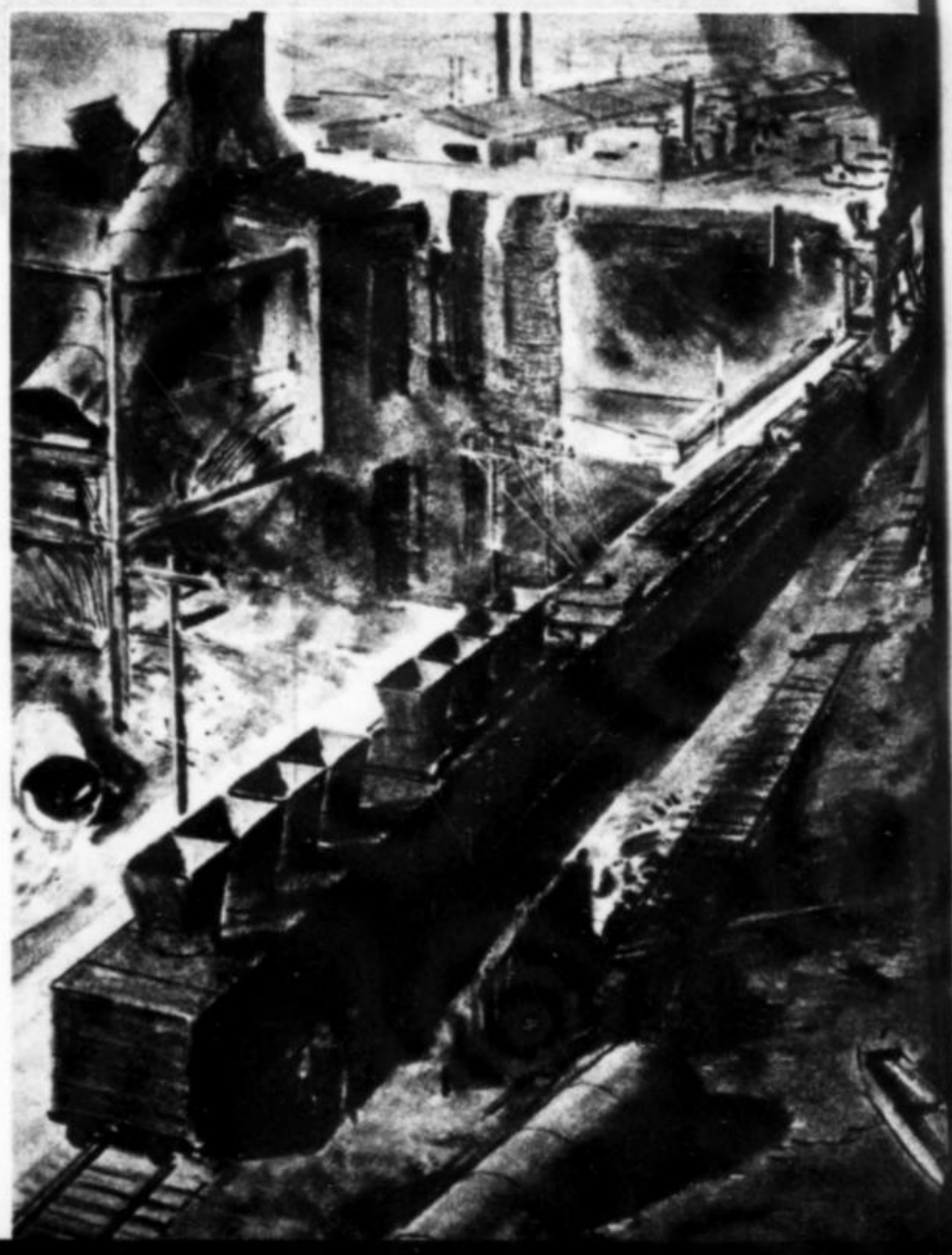
But there is a disadvantage connected with the jet system too, freely admitted by British experts. The fuel consumption is high. And at present nobody knows of a way to cut it down. As a matter of fact theoretical considerations make it seem unlikely that it ever can be cut down to any considerable extent.

If you combine the two main features, inherently high speed and inherently high fuel consumption, you get a plane which is very fast but has little "endurance," in other words a comparatively short range. In fact it owes what range it has mainly to its enormous speed. If you have only half an hour's operation with a plane that does only 200 m.p.h., you can, at the very best, bridge a distance of a hundred miles. But if you get, say, eight hundred miles out of it for half an hour you can contemplate bridging a distance of about four hundred miles.



POWERHOUSE ON WHEELS

This sleek eight-car train is a roving power plant, equipped with boiler cars, condenser units, and steam-run turbine.



BOMB-TORN cities wrested from the Axis will be getting all the power they need from these mobile plants now being turned out by Westinghouse in preparation for the big invasion push. One of these rolling powerhouse units, complete from vaporizing equipment to windmill -like turbine, can work up 5,000 kilowatts of electricity, enough to supply a town of 10,000 people or run a large-scale factory. On the heels of the advancing troops, before the smoke of battle has cleared. one of these plants can be brought up and put into operation pinch-hitting for wrecked power installations. Ordinarily it would take from nine months to two years to get a bombed or sabotaged power plant running again.

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OCTOBER

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RACE TRACK KING DESIGNS OWN CONVERTIBLE

Hand-Made Car Cruises at 120 MPH—See Page 82

volume 39 number 12

mechanix illustrated

october 1948

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Cover helicopter photo by Ross-Pix and auto photos by Tom McCahill

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THE enemy struck the first blow without warning. One-way suicide bombers still are streaking across the dark sky, rocking our big cities, ripping up our key airfields, smashing at our atomic arsenals. Some of our planes try to hit back at the enemy but vanish in a terrific blast before they can clear the shattered runways.

But far from the flaming cities and the exploding planes there's a strange bustling of dimmed-out trucks and military cars around a rolling farm field. Suddenly the ground at the foot of that isolated field opens up. A huge airship emerges slowly from the earth, then shoots aloft into the night.

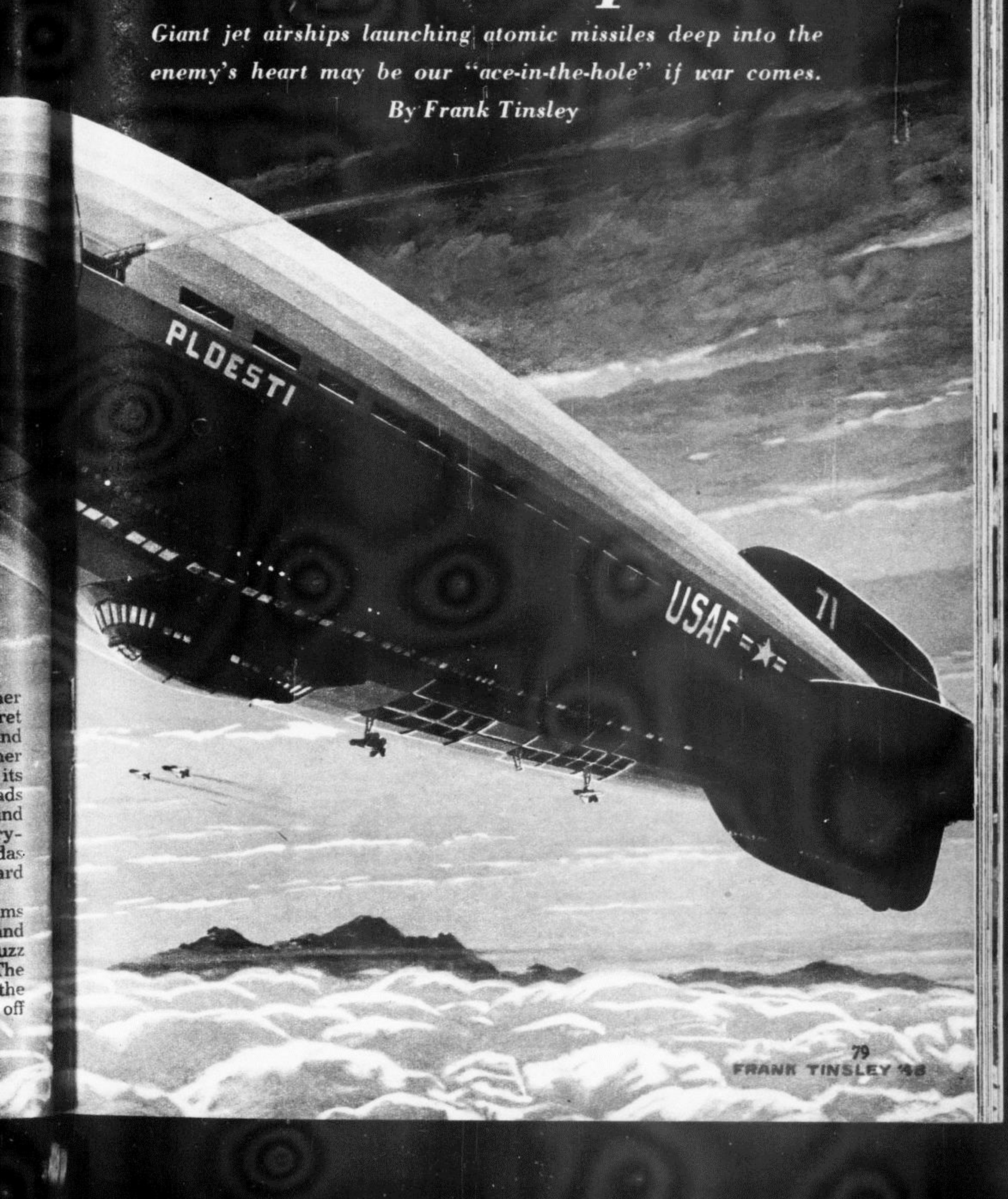
The Ploesti, one of America's new jet dirigibles named for famous air strikes of World War II, whizzes off to join the other giant airships slipping out of their secret hangars buried in the farmlands around Lakehurst, N. J. On the west coast another mighty fleet of jet airships also arms its long-range missiles with atomic warheads and bursts forth from other underground shelters hidden in the California countryside. The two lighter-than-air armadas fan out through the night and steal toward the enemy's home bases.

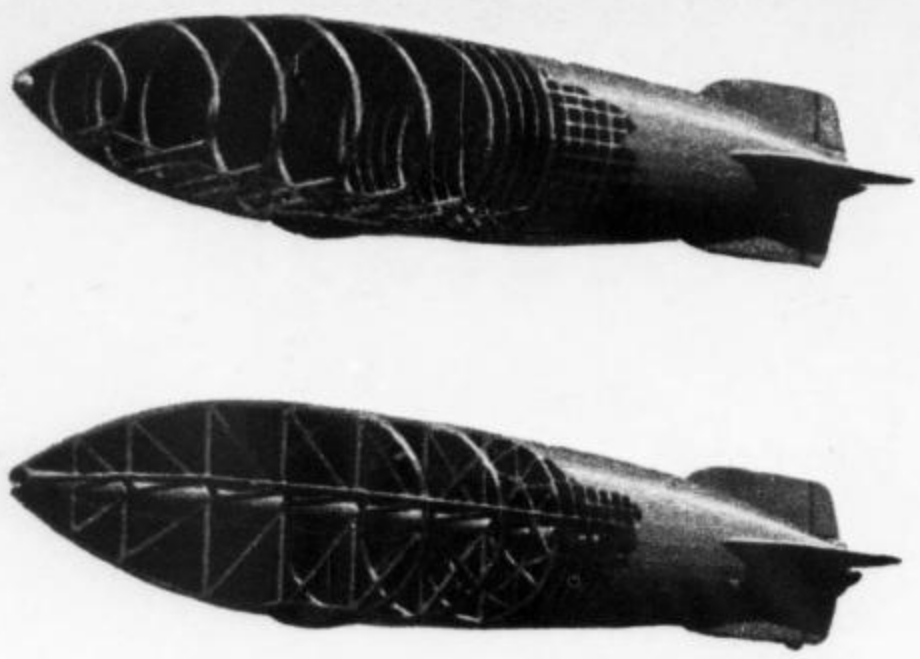
All during the night the Ploesti zooms through black layers of cloud. Now and then her tiny brood of night fighters buzz close under the great ship's belly. The parasite planes hook on briefly to the mother ship for refueling, then drop off again to resume their fighter patrol.

Is This America's Secret Weapon?

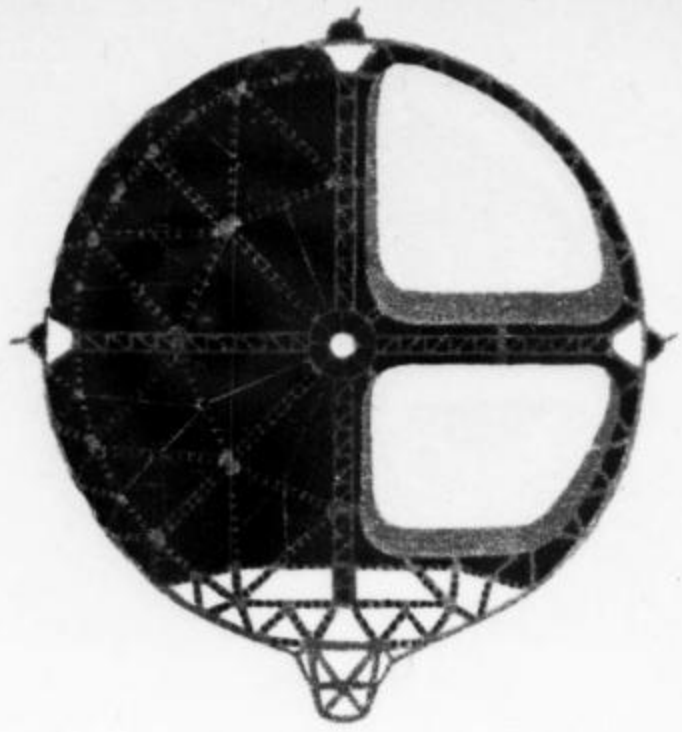
Giant jet airships launching atomic missiles deep into the enemy's heart may be our "ace-in-the-hole" if war comes.

By Frank Tinsley

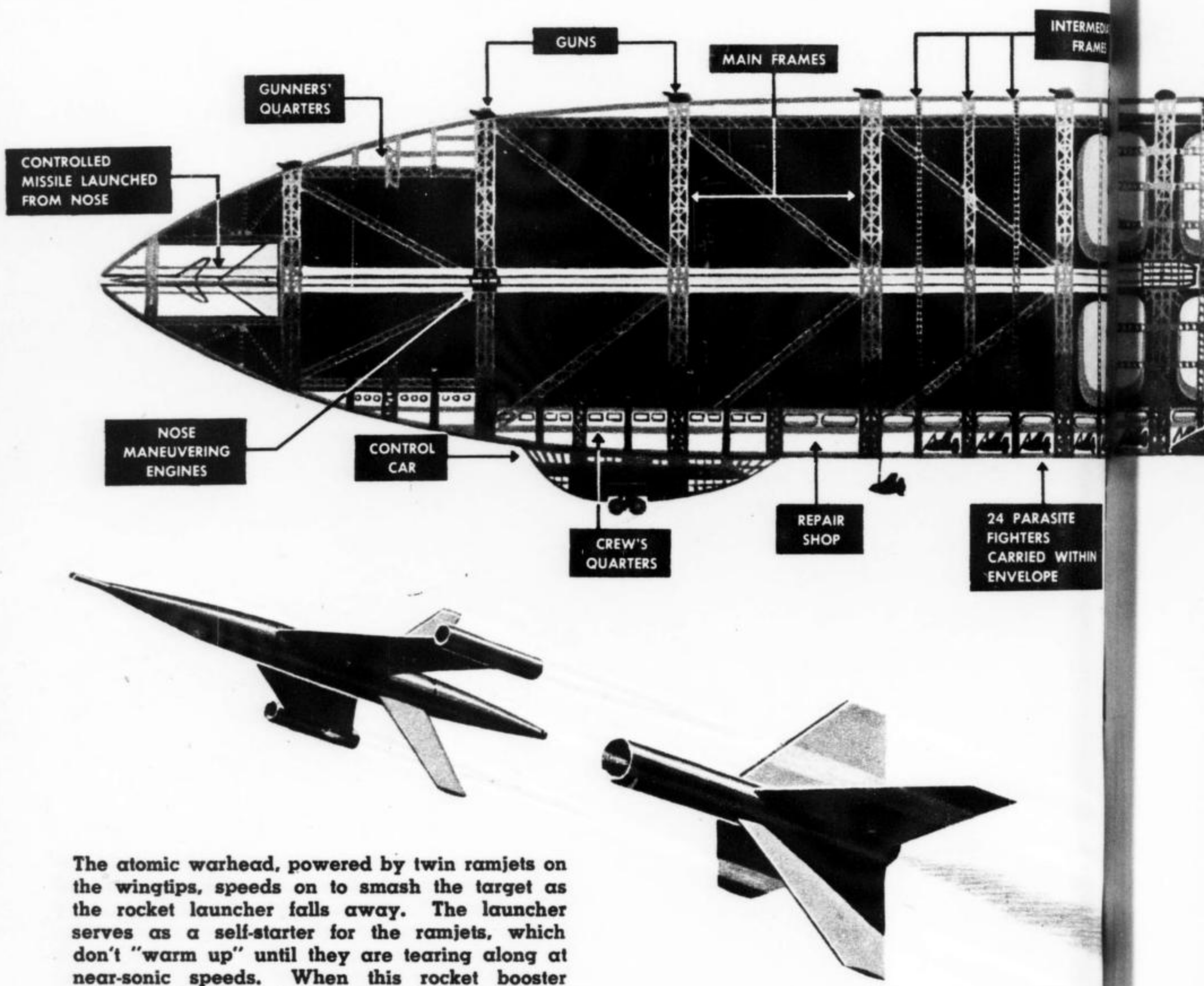




These cutaway drawings reveal the jet airship's sturdy magnesium structure and fishlike skeleton.

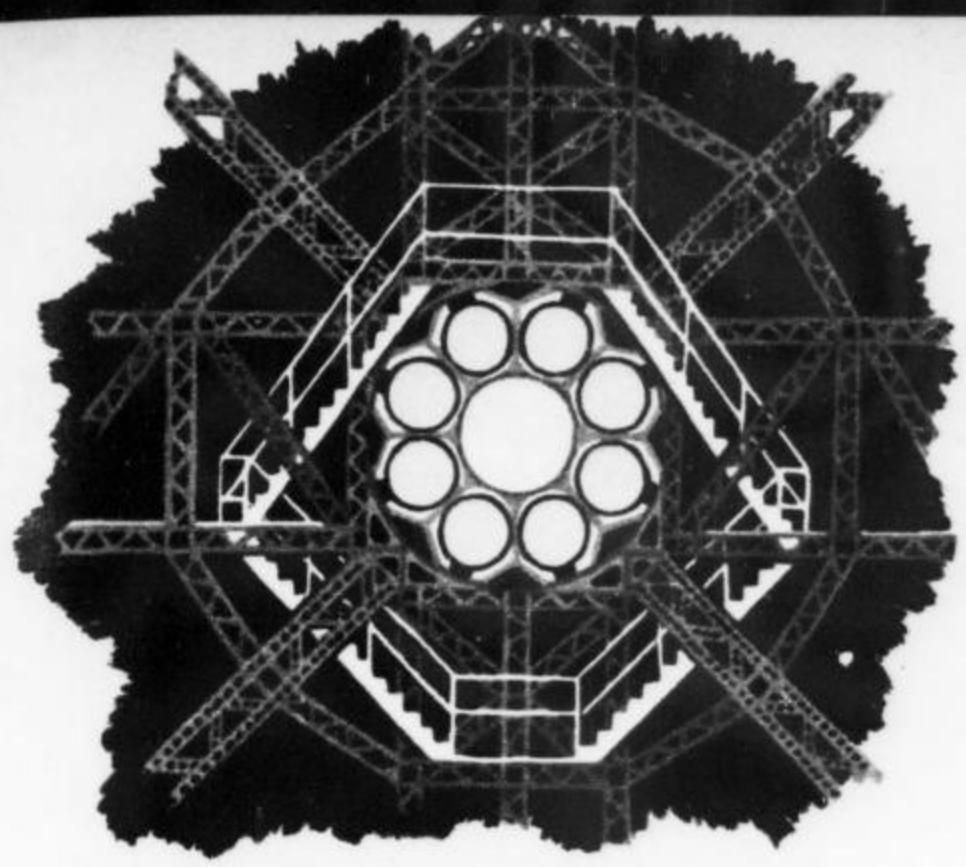


Head-on structural view shows how guns and gas cells are mounted securely in the big dirigible.

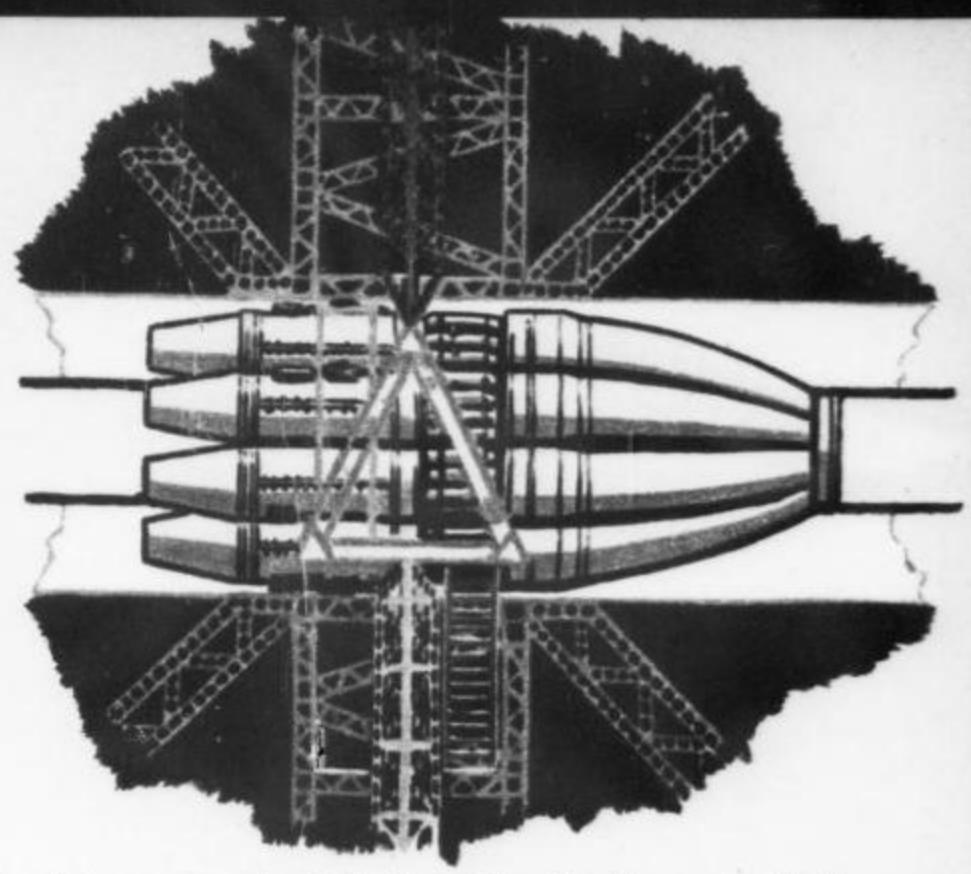


The atomic warhead, powered by twin ramjets on the wingtips, speeds on to smash the target as the rocket launcher falls away. The launcher serves as a self-starter for the ramjets, which don't "warm up" until they are tearing along at near-sonic speeds. When this rocket booster exhausts its liquid fuel after a few seconds of dazzling, flame-streaked flight, the launcher automatically detaches itself from the missile.

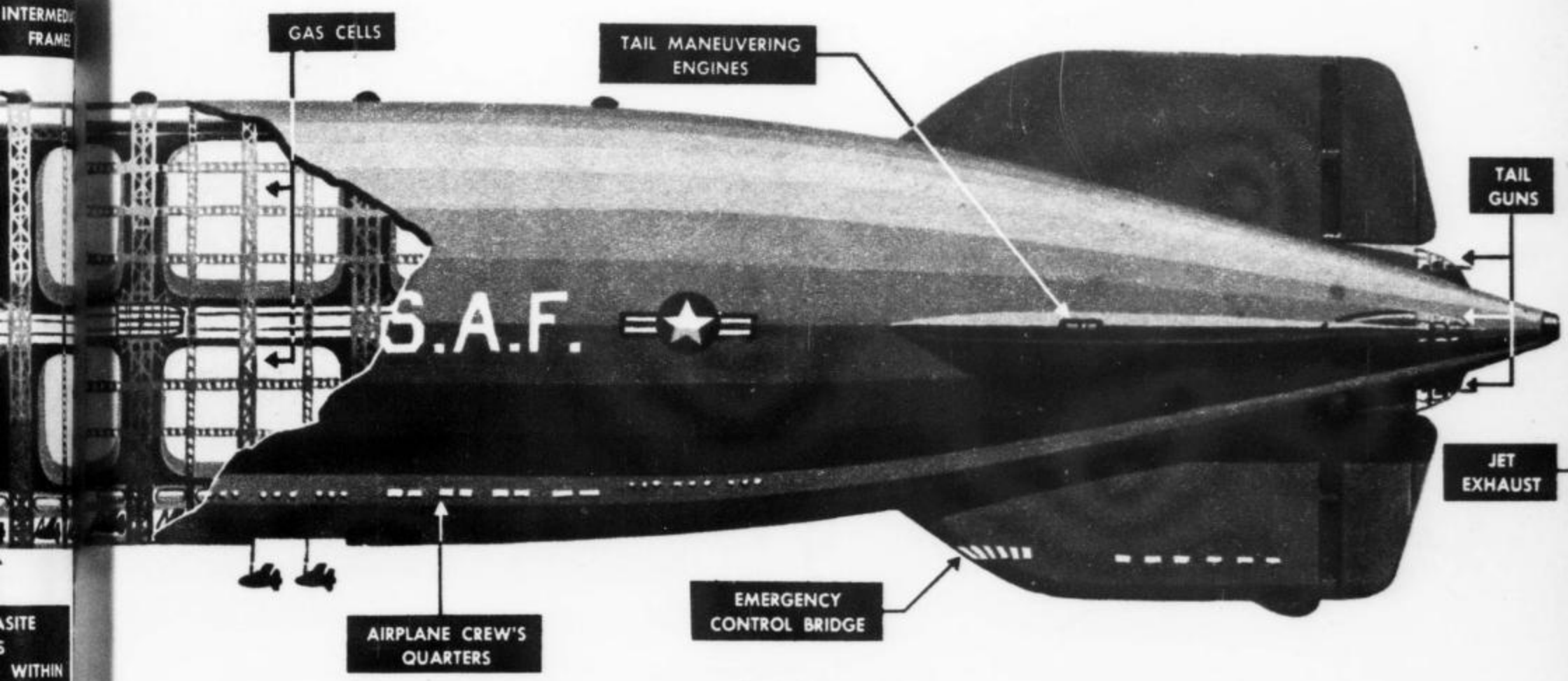
FRANK TINSLEY '48



Big tailpipes fire powerful thrusts from the jet engines to drive the ship forward at high speed.



The jet power plant is built in the "marrow" of the backbone running through the ship's center.



At dawn the Ploesti and the other airships in her fleet are spread out hundreds of miles off the enemy's shore. The Ploesti's skipper glances at the red dot pencilled on the target chart before him, then pulls a lever on the control board. The ship swerves and shudders as the steering propjets swing out of their wells and spin the ship into firing position.

The missile crew at the firing station in the nose arms the warhead and stands by for the flash from the skipper. The fighter escort opens out in a wide funnel before the airship's missile-loaded bow. Quickly the skipper double-checks each department. All clear.

Tensely the skipper jockeys the propjets and steadies the ship's great guided-missile gun on its invisible target deep in the enemy's heartland. The red fingers on the aiming dial now quiver directly under the cross hairs. The skipper jabs his thumb against the firing button. The ship staggers with shock and pitches the captain hard against the target chart.

The Ploesti's nose gleams scarlet as the flaming launcher drives the missile clear of the bow tube. Thunder of the powerful rocket engine stuns the firing crew as the missile hurtles over the horizon like a dazzling comet.

The captain braces himself after that first shock, then quickly fires missile after missile until his full atomic load has been "dumped" at the target. As he starts to speed the ship [*Continued on page* 148]

2nd FLOOR

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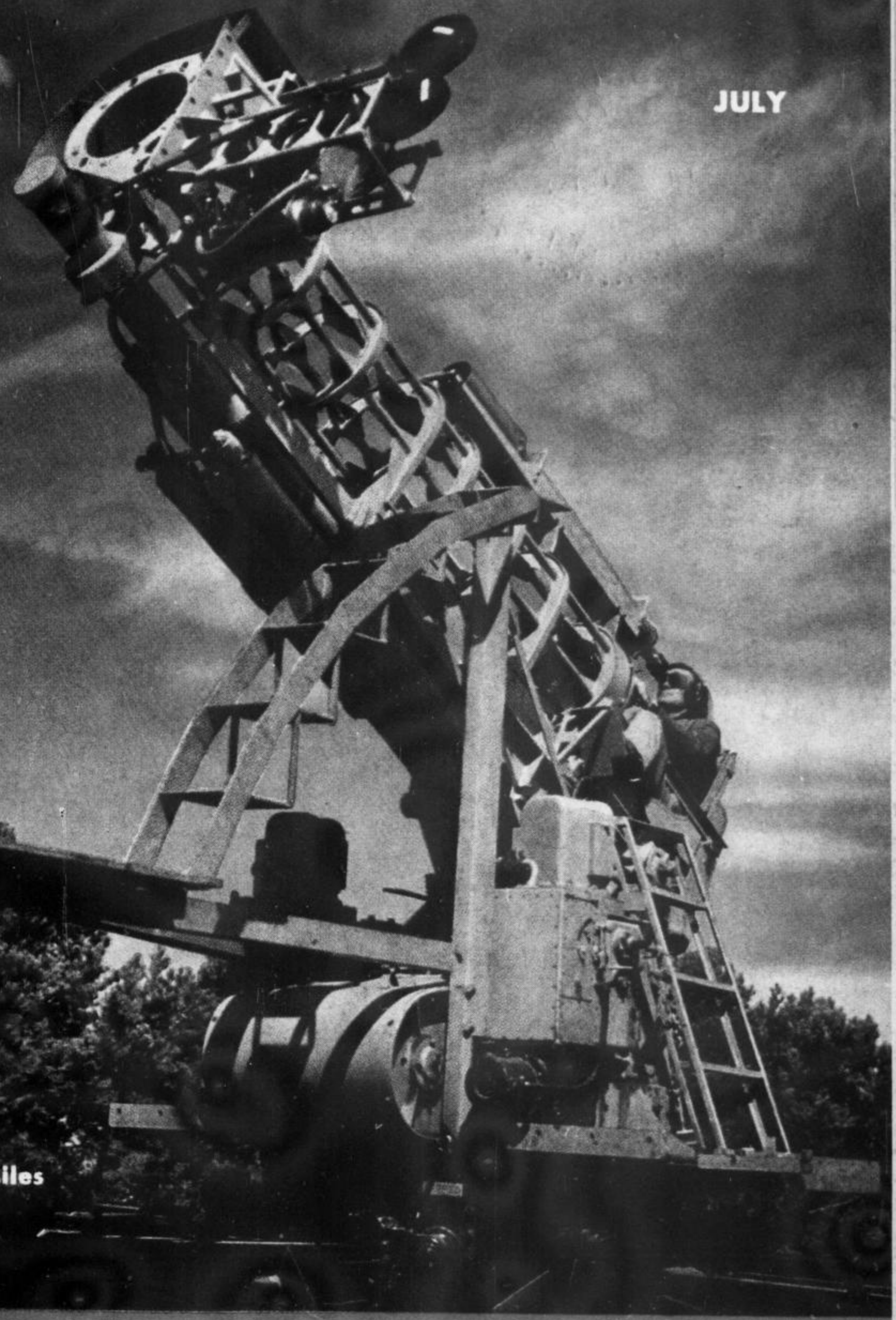

elescope 'gun'
hoots guided missiles

MI PREVIEWS THE NEW FORD

BUILD A GAS-POWERED DC-3 MODEL PLANE

volume 39 number 9

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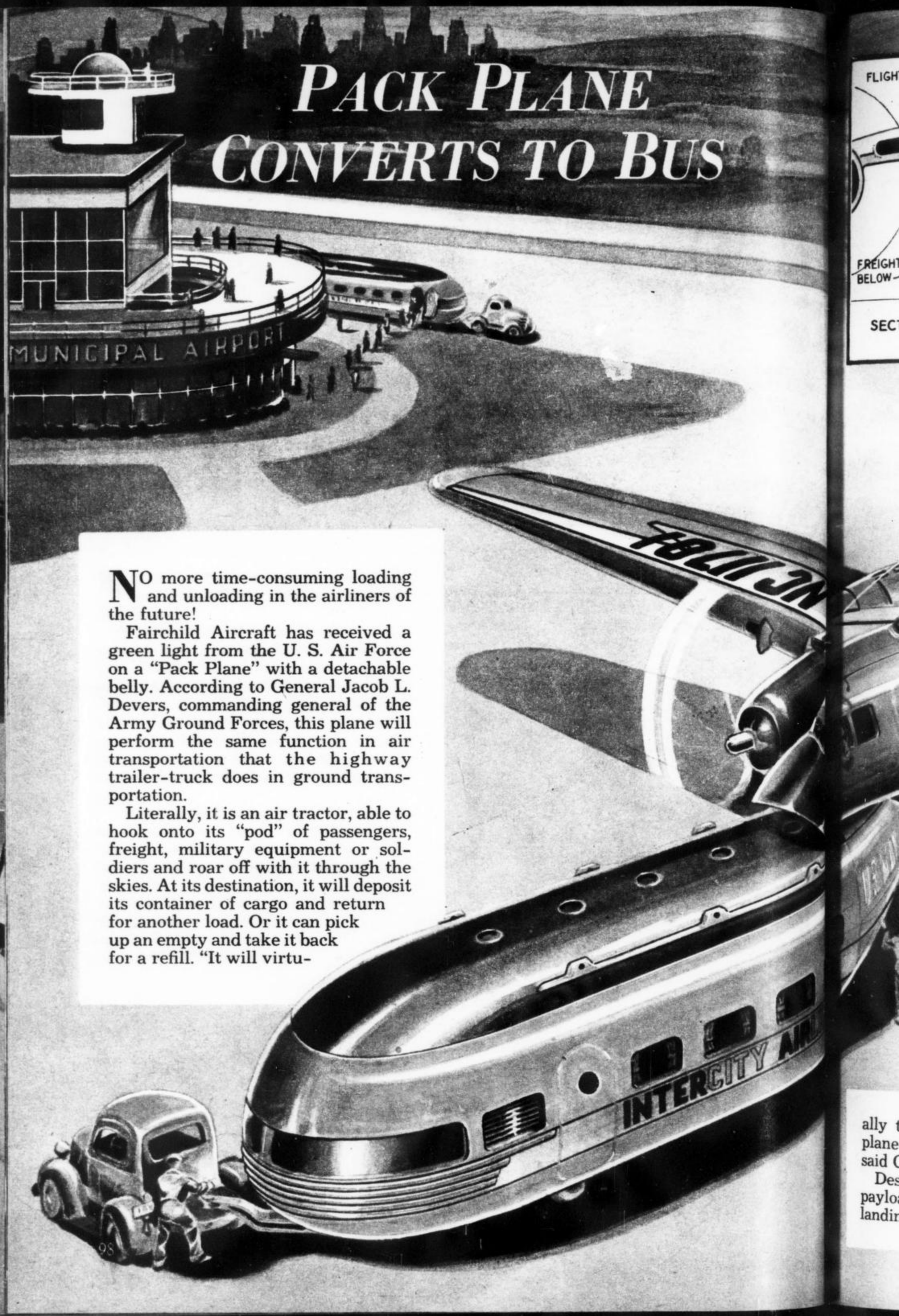
PACK PLANE CONVERTS TO BUS

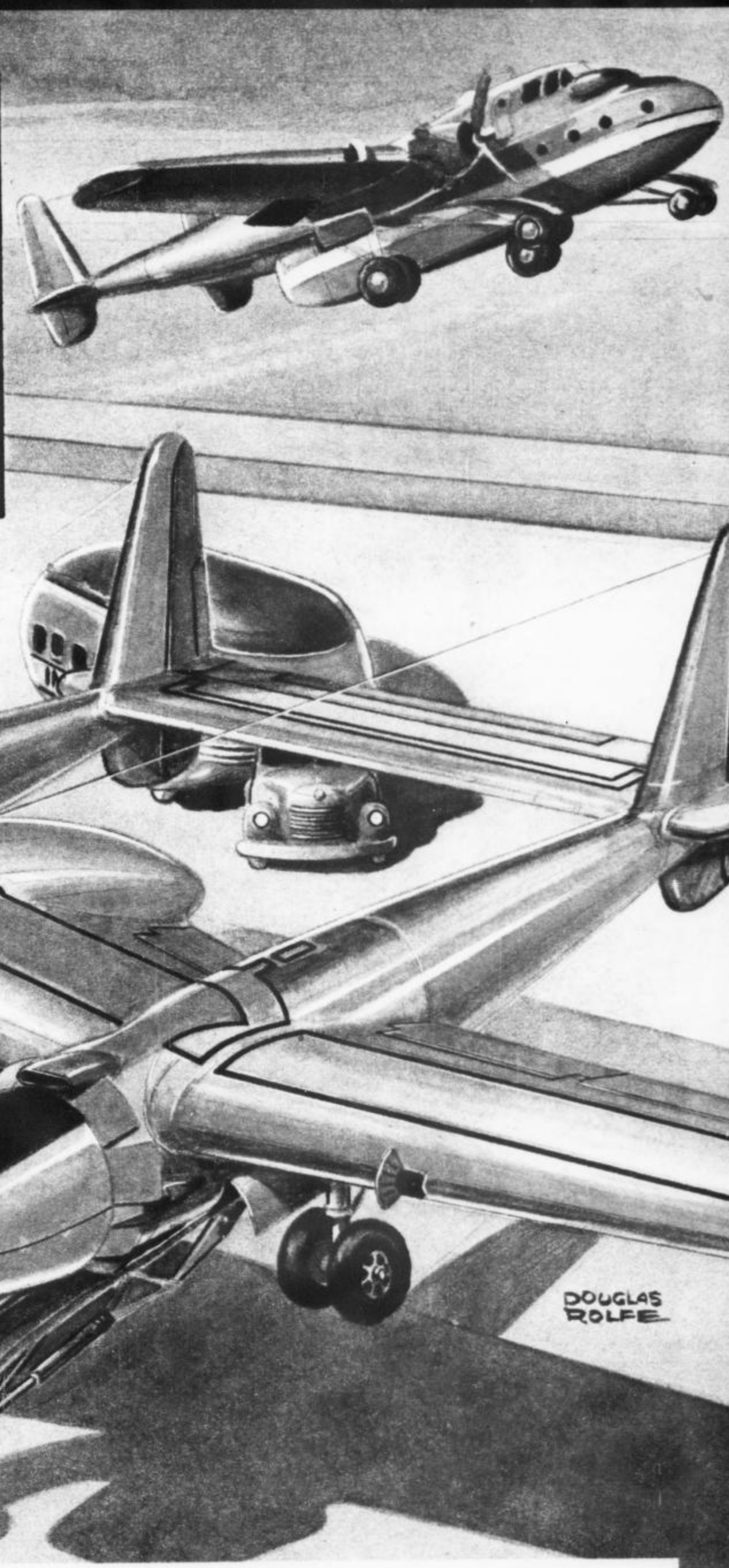


NO more time-consuming loading and unloading in the airliners of the future!

Fairchild Aircraft has received a green light from the U. S. Air Force on a "Pack Plane" with a detachable belly. According to General Jacob L. Devers, commanding general of the Army Ground Forces, this plane will perform the same function in air transportation that the highway trailer-truck does in ground transportation.

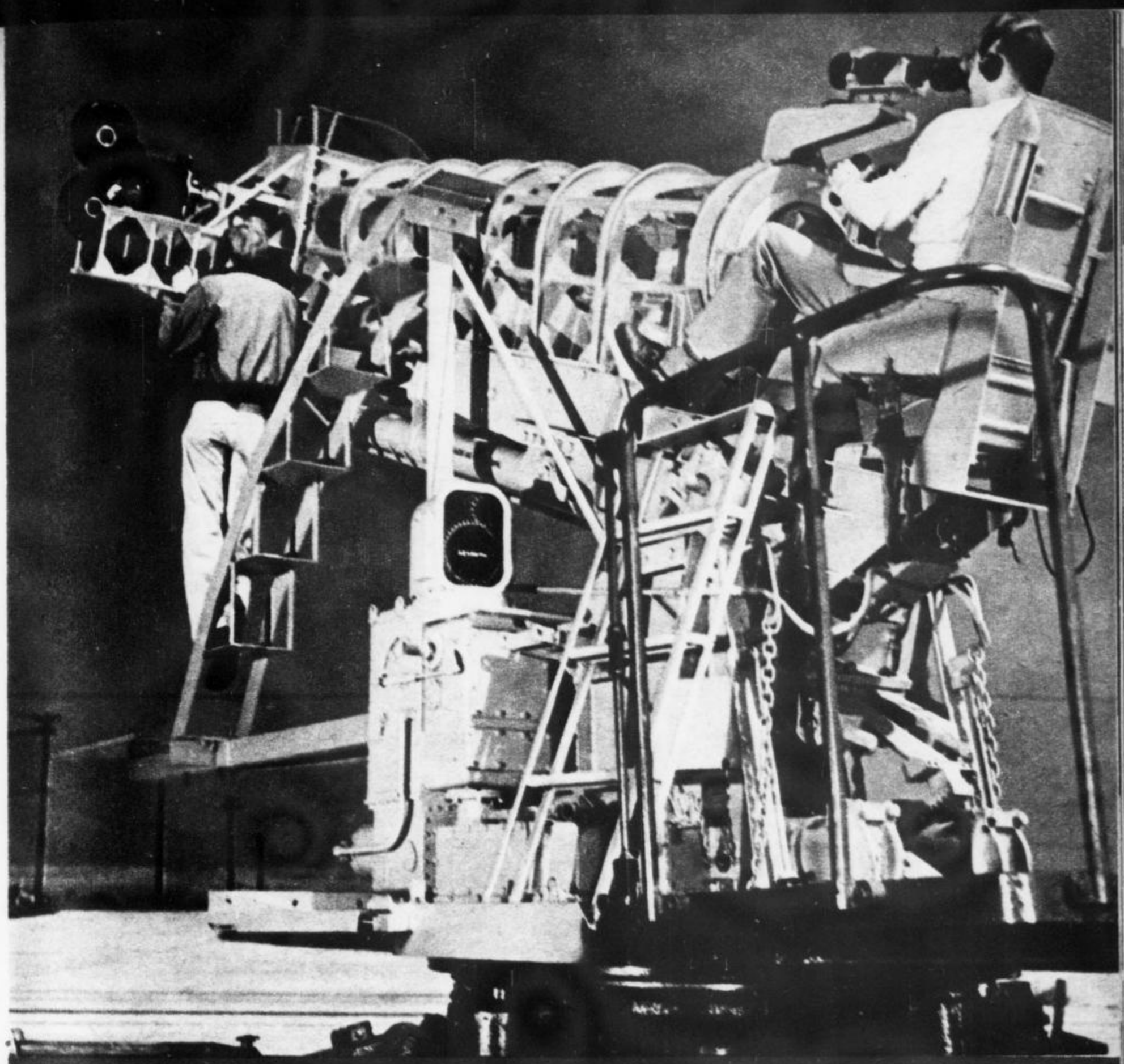
Literally, it is an air tractor, able to hook onto its "pod" of passengers, freight, military equipment or soldiers and roar off with it through the skies. At its destination, it will deposit its container of cargo and return for another load. Or it can pick up an empty and take it back for a refill. "It will virtu-

SECTION THRU PACK-PLANE



ally triple the transport efficiency of the plane as applied to military operations," said General Devers.

Designs call for a pack with a nine-ton payload and a 2,000-mile range. The plane's landing gear will be supplemented by wheels under the pack, itself. In this drawing an MI artist has shown a scene which might very well occur within the next few years. The passenger pod is being attached to its ground tractor while another is being towed to position. •

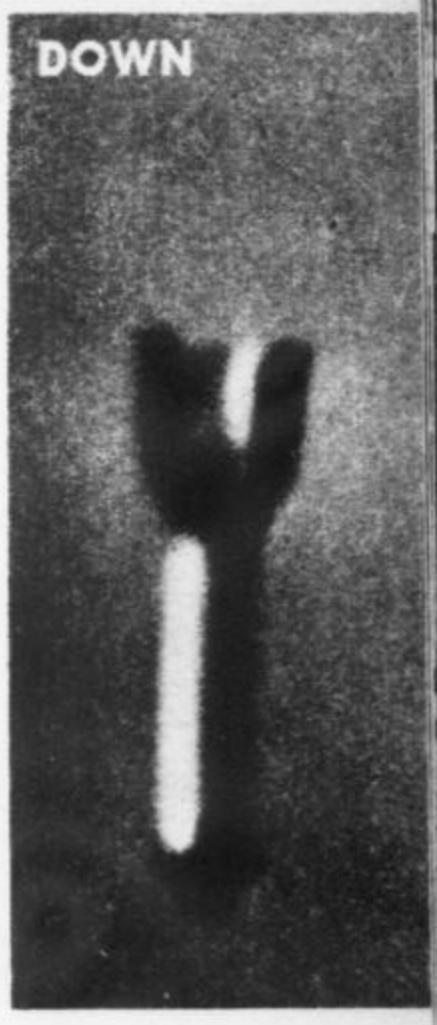


Telescope Tracks Guided Missiles

YOU can't take a ride in a V-2 rocket—yet, but with this fantastic device you can do the next best thing.

It's not what it might appear to be at first glance: a Buck Rogers contraption for fending off interplanetary invaders. The Ordnance officer in charge will tell you that it's the new "Long-Range Tracking Telescope" which can bring you right up close to a V-2 in its 100-mile-high flight. As a matter of fact, the mechanism is so fine that with it you can see a clock dial mounted on the side of the rocket 100 miles up.

This instrument is a 16-inch reflecting telescope set on a 90-mm antiaircraft gun mount. A high-speed 35-mm camera is fastened near the front end. The operator reclines in an easy chair at the back of the long tube and aims it through a small refracting telescope. Another photo is shown on MI's cover. •



Lightning Hits Plane

Three million volts of lightning failed to damage this airliner! It's only a model, but according to tests conducted by Westinghouse, even its big brothers, the man-carrying variety, are just as immune to lightning bolts. In this experiment, the discharge entered a propeller tip, passed through the fuselage and streaked harmlessly to the ground.

Usually in commercial planes the only damage is the fusing of the radio. Recently a clipper, carrying Eire's former premier De Valera, was struck by lightning. None of the passengers was harmed. •

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FEBRUARY

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TOM McCAHILL TESTS THE 1953 BUICK V8

HOW YOU CAN DEVELOP A PHENOMENAL MEMOR

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ON THE COVER:

This weird beastie, shot in 35-mm Kodachrome, by Paul A. Zahl, is a small wolf spider, genus Pardosa, very common in this country. The white, tusk-like object is an ordinary pin, magnified many times, on which this specimen was impaled for the photo. (He is dead, poor chap.)

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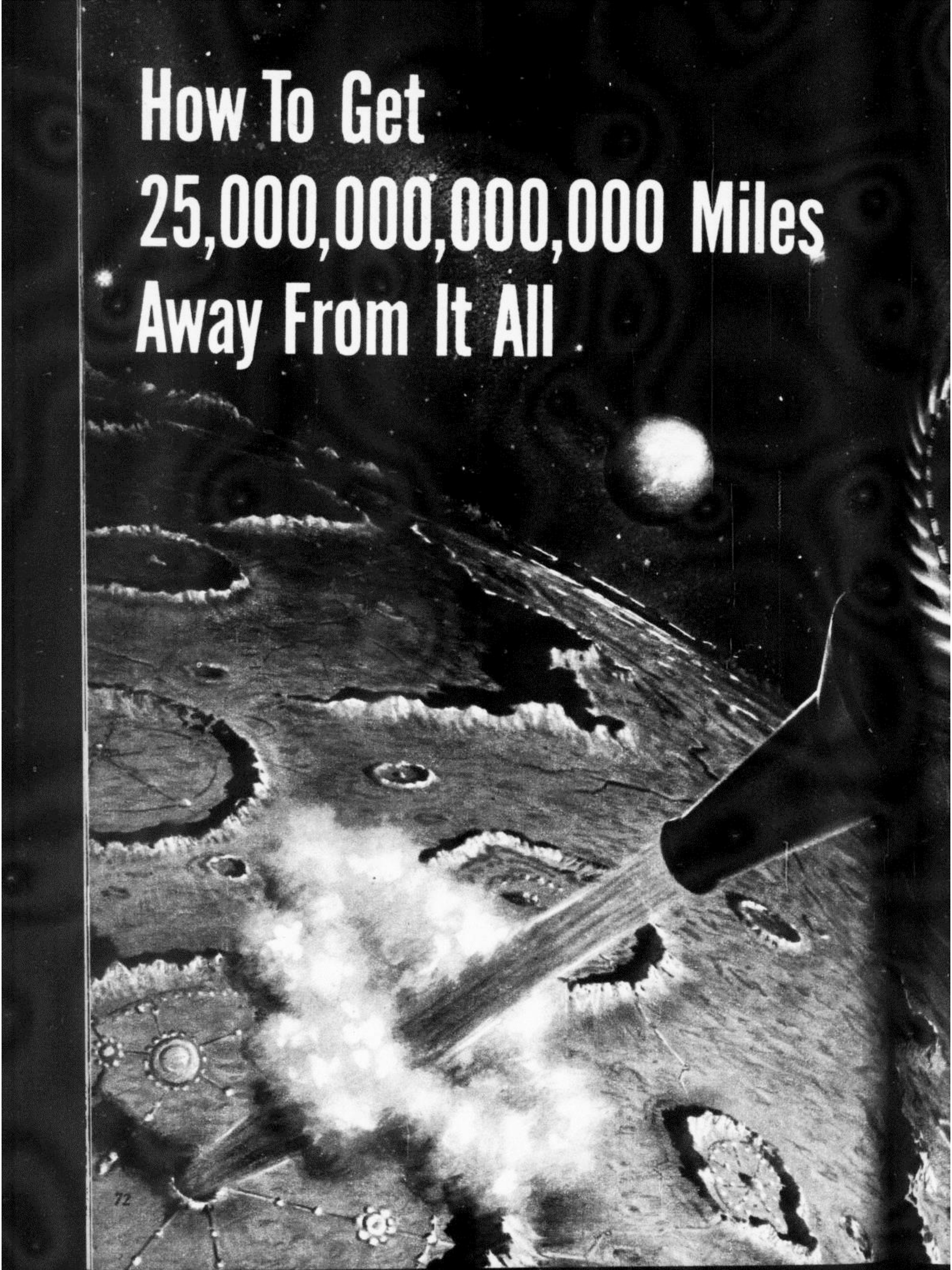
How To Get 25,000,000,000,000 Miles Away From It All

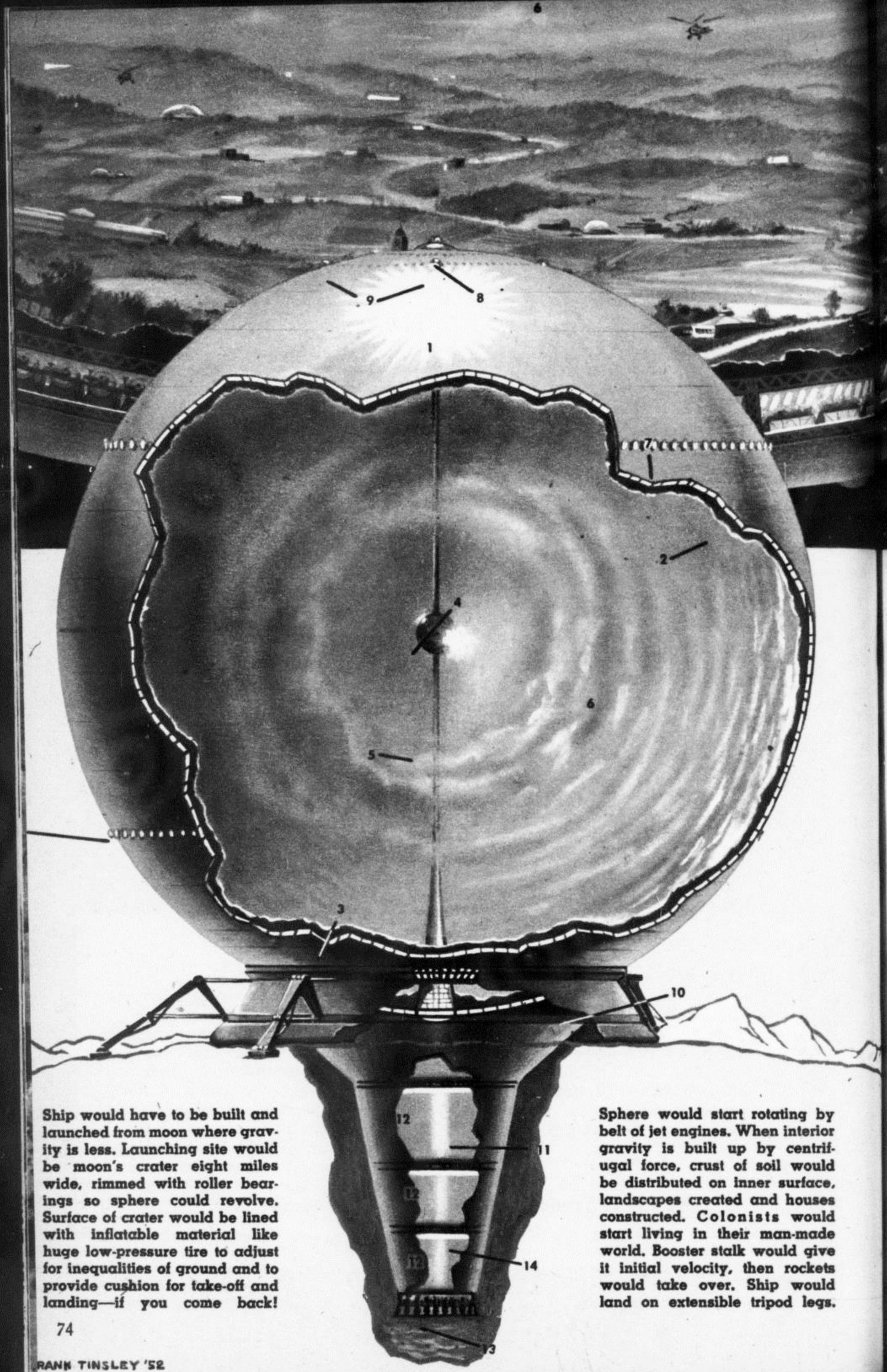


It's not easy. First build a space ship like this one, then, at the speed of light, it will take 30 generations to reach the nearest star.

By Frank Tinsley

FEW people realize the illimitable size of the cosmos in which they live. Even the nearest stars are separated from us by spaces so immense as to be almost incomprehensible to earthbound minds. Beyond lie black voids so vast that our whole solar system—sun, planets and satellite moons—is but a tiny pinpoint of light in a single galaxy of stars! The distances involved are so enormous that they are computed not in miles

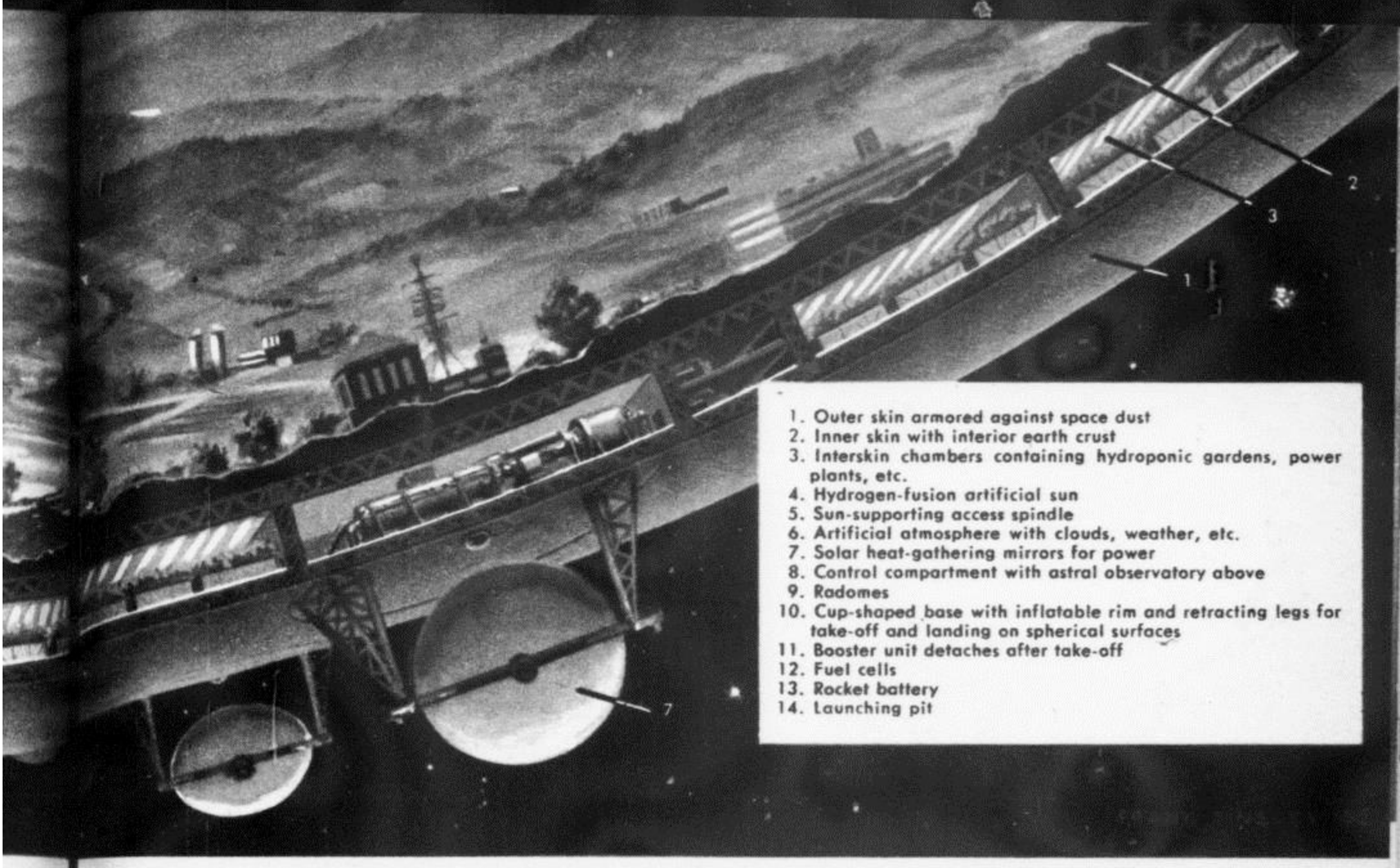
FRANK TINSLEY



Ship would have to be built and launched from moon where gravity is less. Launching site would be moon's crater eight miles wide, rimmed with roller bearings so sphere could revolve. Surface of crater would be lined with inflatable material like huge low-pressure tire to adjust for inequalities of ground and to provide cushion for take-off and landing—if you come back!

Sphere would start rotating by belt of jet engines. When interior gravity is built up by centrifugal force, crust of soil would be distributed on inner surface, landscapes created and houses constructed. Colonists would start living in their man-made world. Booster stalk would give it initial velocity, then rockets would take over. Ship would land on extensible tripod legs.

FRANK TINSLEY '52



but in time. Astronomy's unit of measurement is the light-year, the distance traveled by light in one year at a speed of 186,000 miles per second. Multiply this speed in a year (670,000,000 mph) by 24 hours and then by 365 days and you have the basic unit. It is a cute, little pocket ruler 5,880,000,000,000 miles in length!

There are eight stars within ten such light years of our sun. Of these stellar neighbors, Alpha Centauri and Proxima Centauri are the nearest. Faint pinpoints of light visible only by telescope, they are a modest 4.3 light-years away.

Starting with a space ship of present day rocket performance, a top speed of around 6.2 miles per second, Dr. L. R. Shepherd, Technical Director of the British Interplanetary Society, calculates that at that velocity it would take about 130,000 years to reach one of these stars. Alongside of this, a trip to the moon would be a mere ferryboat ride! This trip would entail the birth and death of some 30 generations en route.

To contain such a colony, its animals, plant life, etc., the space vehicle would have to be a modern Noah's ark. The problems involved in maintaining artificial atmosphere and armoring the hull against cosmic dust particles make a spherical form almost obligatory. It would have to be enormous with a minimum diameter of ten miles. It would have to revolve around its directional axis to provide artificial gravity through centrifugal force, yet have fixed polar areas for astronomical observation, navigation, etc. It would have to take off from the moon where the gravitational pull is only one-sixth that of earth.

In the sphere, life would be conducted as nearly as possible as it is on earth. The whirling globe would contain towns and countryside, soil for crops, trees, lakes, roads and houses. There should be a sky above, an artificial reproduction of our atmosphere with a sun, moon, stars, day and night and even the change of seasons. In short, our space vehicle must be a small, self-contained world with all the features of our natural one. The only major difference would be that our colonists must inhabit the *inside* of their man-made planet instead of its exterior!

The design and construction of this monster globe is no short term proposition. It is a job for several generations—perhaps centuries!

The globe itself would be double-walled, with an armored outer skin and an inner pressure hull to hold the atmosphere. The space between would contain a tremendous area of hydroponic gardens, lit by artificial sun lamps and fed by chemical fertilizers for the manufacture of oxygen by natural plant processes. The outer skin would be pierced by rows of observation ports, radar domes and belts of solar heat plants.

Science-fiction? Maybe so, but it's your vehicle if that's where you want to go. •

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Volume 52, Number 9

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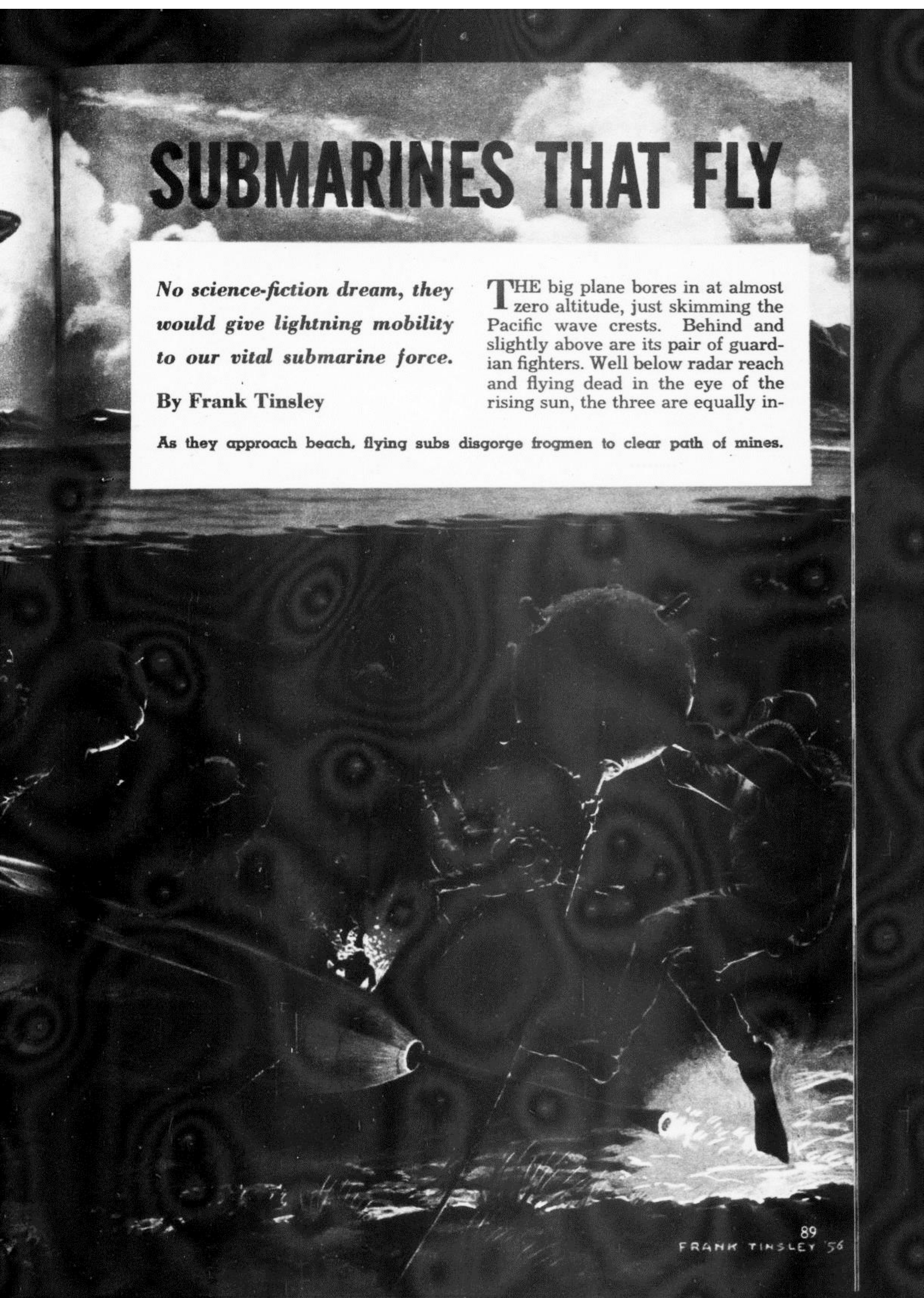
SUBMARINES THAT FLY

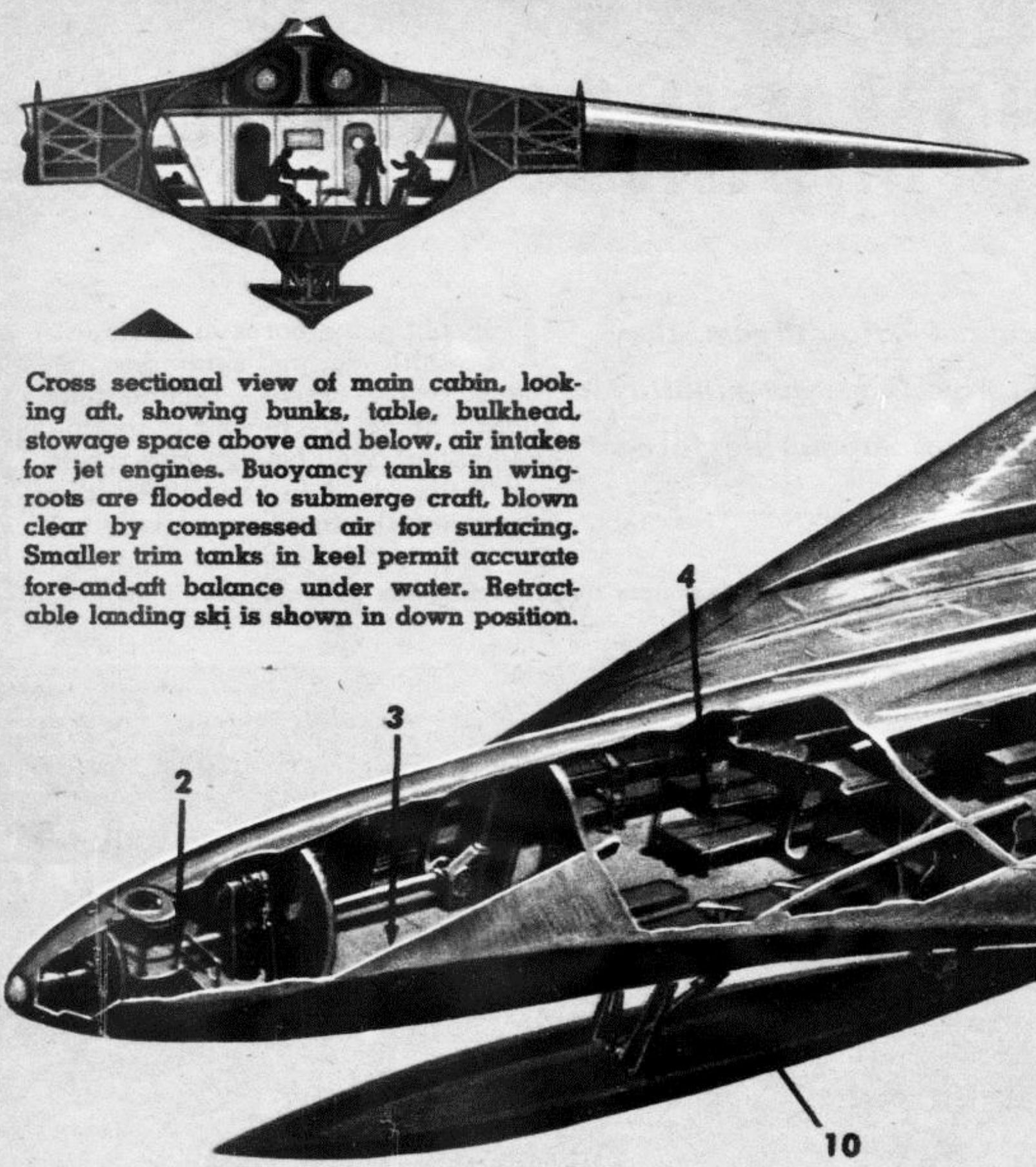
No science-fiction dream, they would give lightning mobility to our vital submarine force.

By Frank Tinsley

THE big plane bores in at almost zero altitude, just skimming the Pacific wave crests. Behind and slightly above are its pair of guardian fighters. Well below radar reach and flying dead in the eye of the rising sun, the three are equally in-

As they approach beach, flying subs disgorge frogmen to clear path of mines.





Cross sectional view of main cabin, looking aft, showing bunks, table, bulkhead, stowage space above and below, air intakes for jet engines. Buoyancy tanks in wing-roots are flooded to submerge craft, blown clear by compressed air for surfacing. Smaller trim tanks in keel permit accurate fore-and-aft balance under water. Retractable landing ski is shown in down position.

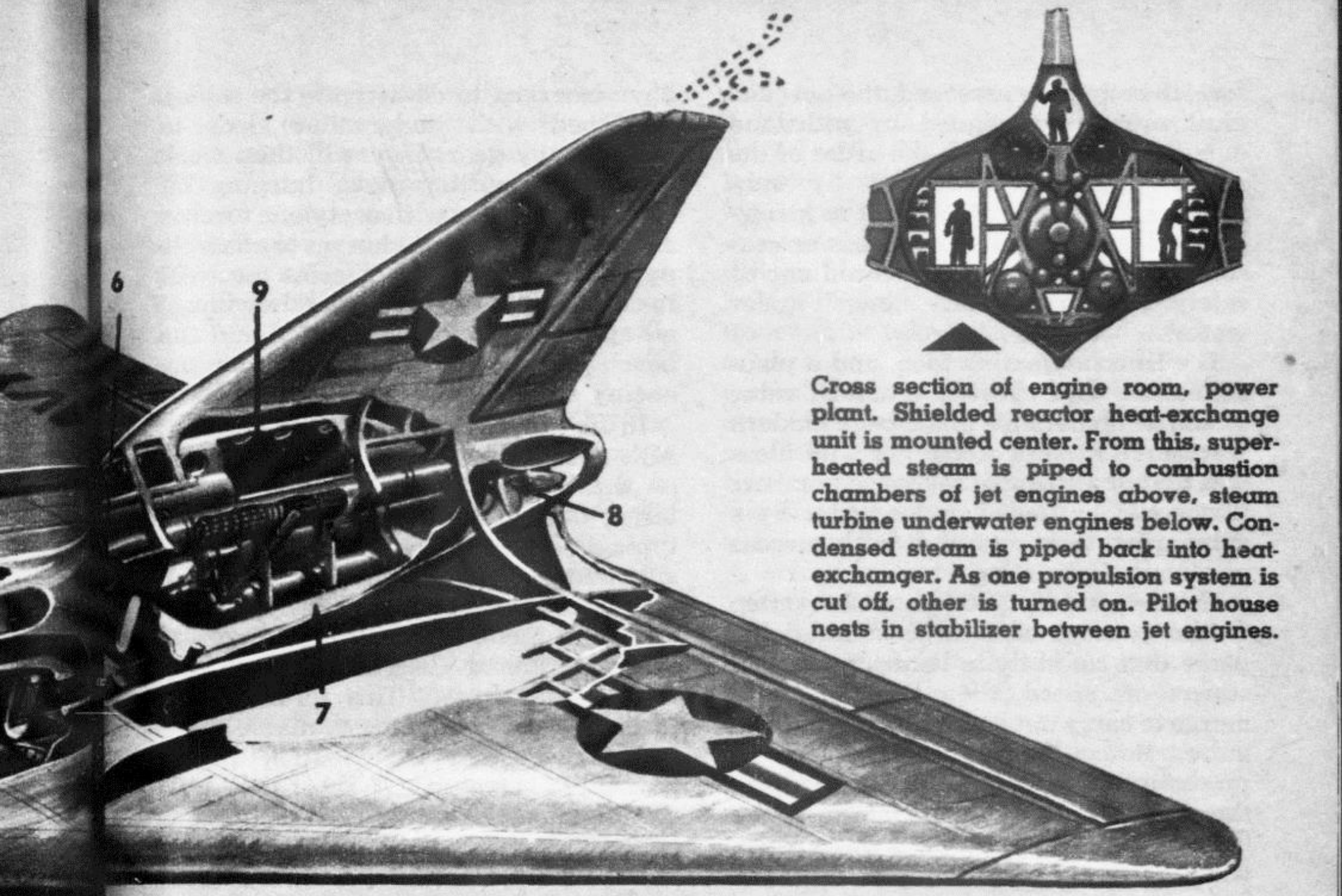
In this cutaway view the brown area is the pressure hull; air-sea atomic plant is shown in red. 1. "Periscope" containing underwater TV eye; 2. Bow mooring compartment and air-lock for underwater entry and exit; 3. Frogmen's dressing room; 4. Quarters for frogmen, marine raiders; 5. Passenger cabin, with mess table center and berths along sides

visible to electronic watchmen and dazzled sentries posted along the shore.

In the cockpit of the huge delta-wing flying boat, the skipper smiles quietly. He has hit his objective right on the nose, both as to position and timing. The pre-dawn darkness is thinning fast and the long flat rays coming from behind them light the sea just enough for a safe set-down. Smoothly the transport's keel arcs downward to form a ski-like "hydro-lift" and those of the tiny fighters follow suit.

A moment later, the trio are skittering over the rolling ground swells, settling gradually on their vee-bottom hulls as they lose speed. Dark upper surfaces merge with the blue of the sea; their wakes fade and the planes seem to disappear in the glare of the dawn as they taxi slowly toward the distant shoreline.

To the uninformed viewer, these air-



Cross section of engine room, power plant. Shielded reactor heat-exchange unit is mounted center. From this, superheated steam is piped to combustion chambers of jet engines above, steam turbine underwater engines below. Condensed steam is piped back into heat-exchanger. As one propulsion system is cut off, other is turned on. Pilot house nests in stabilizer between jet engines.

FRANK TINSLEY 56

(for evacuating casualties); 6. Crew quarters with enclosed galley center; 7. Engine room, showing jet engines above, turbines below atomic reactor; 8. Marine propellers retract during flight; 9. Pilot house. Note the snorkel, periscope projecting from vertical fin, indicated in drawing by dotted lines. 10. Retractable hydro-lift for landing, takeoff.

craft are a triad of Navy flying boats of the Sea Dart type, making a water landing off a hostile coast. A more discerning eye, however, would recognize that big transport as a bird of quite a different feather. It is one of the new hybrids patented by Don B. Doolittle, vice president of the All American Engineering Company of Wilmington, Del. Doolittle's patent descriptions have recently been released from the Navy secret list and his radical concept can now be revealed.

A few years back when Convair's Sea Dart was under study, a cockeyed notion suddenly hit one of the project's engineers. Air, as every high school physics student knows, is just as much a fluid as water, although one of considerable less density. In flying at supersonic speeds, however, this atmospheric fluid is compressed ahead of the plane until its density becomes equal to or greater than that of water. There-

fore, the engineer reasoned, the new aircraft must be designed to withstand outside air pressures on the order of the water pressures withstood by submarines at depth. Being just as strong and well sealed as a sub, there is no reason why our fighter plane could not be safely submerged and "flown" under water.

It was a fascinating idea, and a plausible one. But of what practical value would a submersible plane be in modern warfare? First of a chain of wild ideas was that of a string of seaborne bombers that could be towed under water by a submarine, then sent aloft with cargoes of atomic destruction.

From this point, it was a short step to the concept of a large submersible plane that could fly to its destination at supersonic speed, then land and submerge to carry out its mission. Furthermore, it could be accompanied by protective Sea Dart fighters, refueling them en route. Upon landing, the fighters could dive beneath the surface with the mother ship and be towed by her.

The fighters could be fueled, armed and sent off on sneak raids as before. Or the mother ship might become the primary weapon. Transporting a load of Marine Raiders, she could mount a commando attack. A cargo of frogmen could be secretly disgorged off a beachhead to clear it of obstacles in preparation for a surprise landing operation. The illustration shows such a scene. It has been telescoped in scale to picture the tactics employed.

In the upper left, MI's airphibious weapon is shown in flight, trailed by her fighter escort. Her hydro-lift ski is lowered ready for landing. Below, she has touched down, sealed her aerial jet engines, started her water propellors and slid beneath the surface. Cruising slowly beachward with her television eye extended, the submerged plane has encountered a field of anti landing-craft mines.

Letting go her anchors, she opens the buoyancy tank inlets in her wing roots and sinks smoothly toward the bottom. Meanwhile, her bow hatch has popped open and teams of frogmen have emerged to de-activate the mines. Equipped with underwater sleds to carry heavy gear, they will then work shoreward, cutting nets, burning off steel boat-rippers with acetylene torches and wiring explosive charges to concrete pyramids and other obstacles too solid to destroy otherwise. When they finish, all approaches will be charted and the beach prepared for attack. Ashore, the enemy scans an apparently empty sea.

In line with Don Doolittle's concept, MI's submersible plane design is based on the Sea Dart conformation. It is a large, delta wing flying-boat with the typical Convair vee-bottom and low silhouette. Within this aircraft shell we have placed a submarine-type pressure hull made up of three cylindrical sections joined longitudinally along their center lines. This form of hull utilizes 90 per cent of the available space and provides an arched structure of maximum strength. A short lobe protruding along its upper rear section encloses the pressurized pilot compartment. All passenger and crew accommodations, controls, power plant, etc., are contained within the pressure hull.

Anchoring and mooring are handled in a small bow compartment which doubles in brass as an air-lock for underwater entrance and exit. It is fitted with all the necessary gear including twin anchors, chain locker beneath the deck, winches, an elevated mooring platform, retractable bitts and a large top hatch. Aft of this and separated from it by a bulkhead with watertight doors, is the frogmen's dressing room. It is lined with lockers containing air tanks, masks, tool kits and other subsurface working gear. Still further aft are the plane's living quarters where there are 40 double-decker berths for the passenger complement and 12 more for the off-duty crew. When not in use for sleeping, the lowers convert into rearward facing seats. In the main cabin, amidships, are folding tables and benches which may be set up for mess. Food is prepared in an adjacent galley.

The engine room occupies the entire tail aft of the crew quarters. This space is necessary as the need for separate air and water propulsion systems, makes

the power plant a complicated one. It is based on an atomic reactor, using steam as a heat-exchange fluid.

The design finally chosen is an X form with twin air jets above and a pair of steam turbines mounted below a central reactor unit. This latter is the latest type of compact, lightweight, nuclear furnace. Its core is an atomic pile surrounded by a cylindrical heat exchanger.

Despite its apparent complexity, the functioning of the plant is simple. Steam, superheated by atomic fission, is ducted from the heat exchanger to the four power units. During flight, the turbines are cut off and all the steam is circulated around the combustion chambers of the jet engines. Upon alighting on the water, a main valve cuts off the jet units and the flow of steam is diverted to the turbines.

Operating through a common reduction gear, these drive a pair of contra-rotating marine propellers, mounted on a splined shaft. They can be retracted into the tail cone during flight.

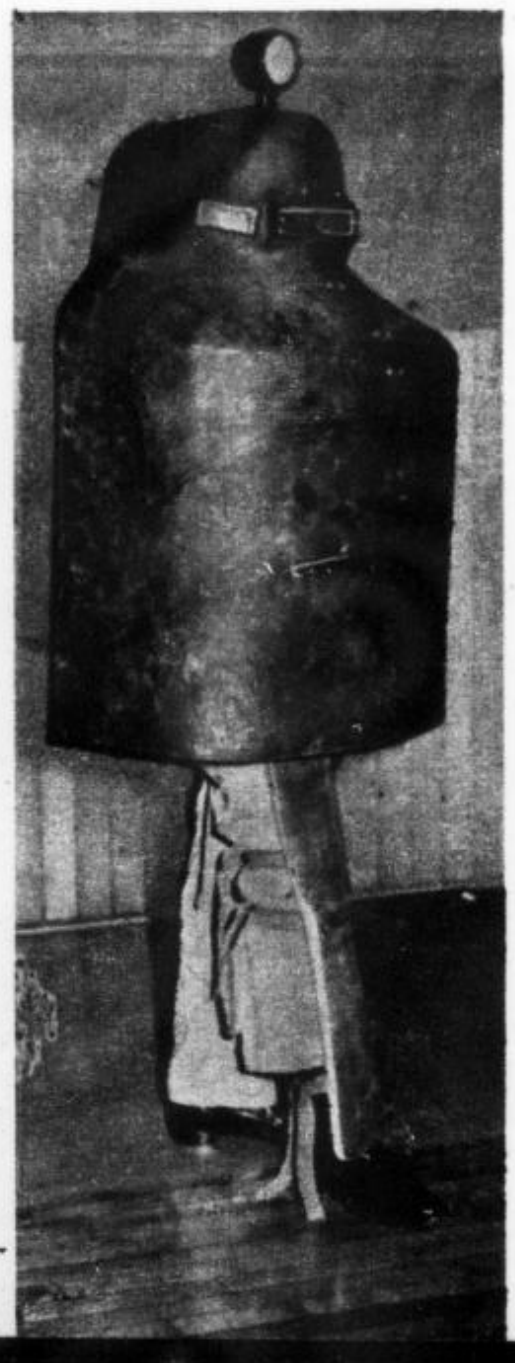
The control deck, reached through a trap door from the engine room, has seats for the pilot, captain, radioman and navigator. The pilot's control column is linked to fly the ship in the air or direct it under water. From his position in the leading edge of the vertical fin, the pilot has excellent visibility under both conditions. In addition, a repeater tube brings him the view ahead seen by the underwater television eye. Mounted on a horizontal periscope, this can be extended ahead of the bow and carries its own high intensity lights. A standard submarine periscope, slanting upward through the fin's forward spar, gives the Captain a view of the surface while submerged. A snorkel, mounted behind it, brings in surface air.

Flying submarines of this type should prove invaluable in the present era of "brushfire wars." Speedy, secret and tactically flexible, they can rush specialists, O.S.S. men or specialized combat crews to any trouble spot in the world. Carrying atomic weapons, their fighter escorts can function as formidable bombers. A realistic approach to our present military needs shows that our armed forces need such weapons now. When are we going to build them? •

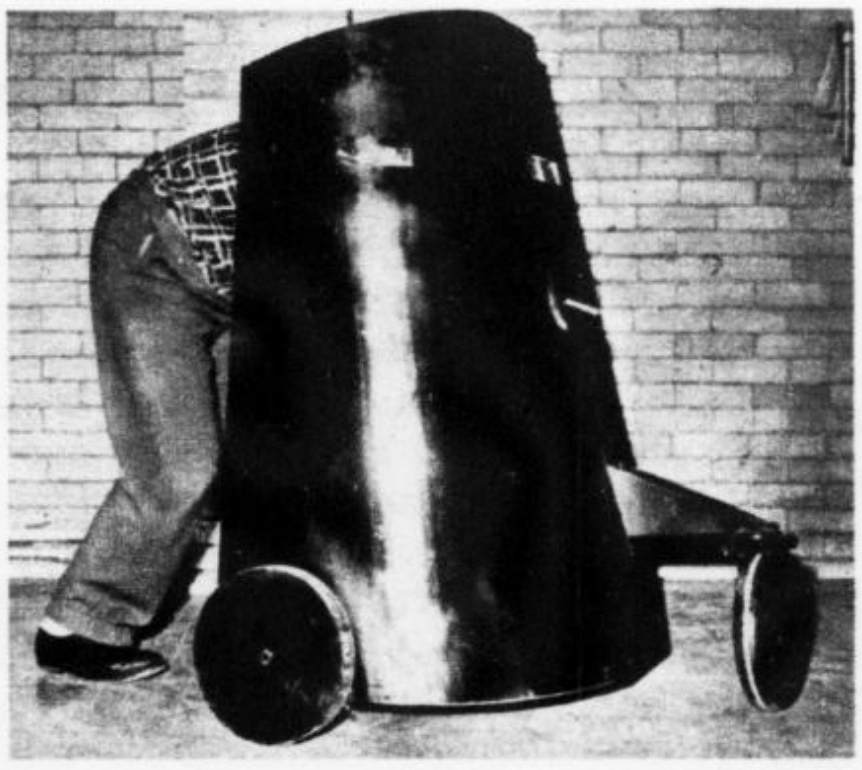
In flight, landing and submerged: flying subs as designed by All American Engineering Co.

ONE-MAN portable 'copter developed for Navy has twin rotors, 2-cylinder, 40-hp engine.

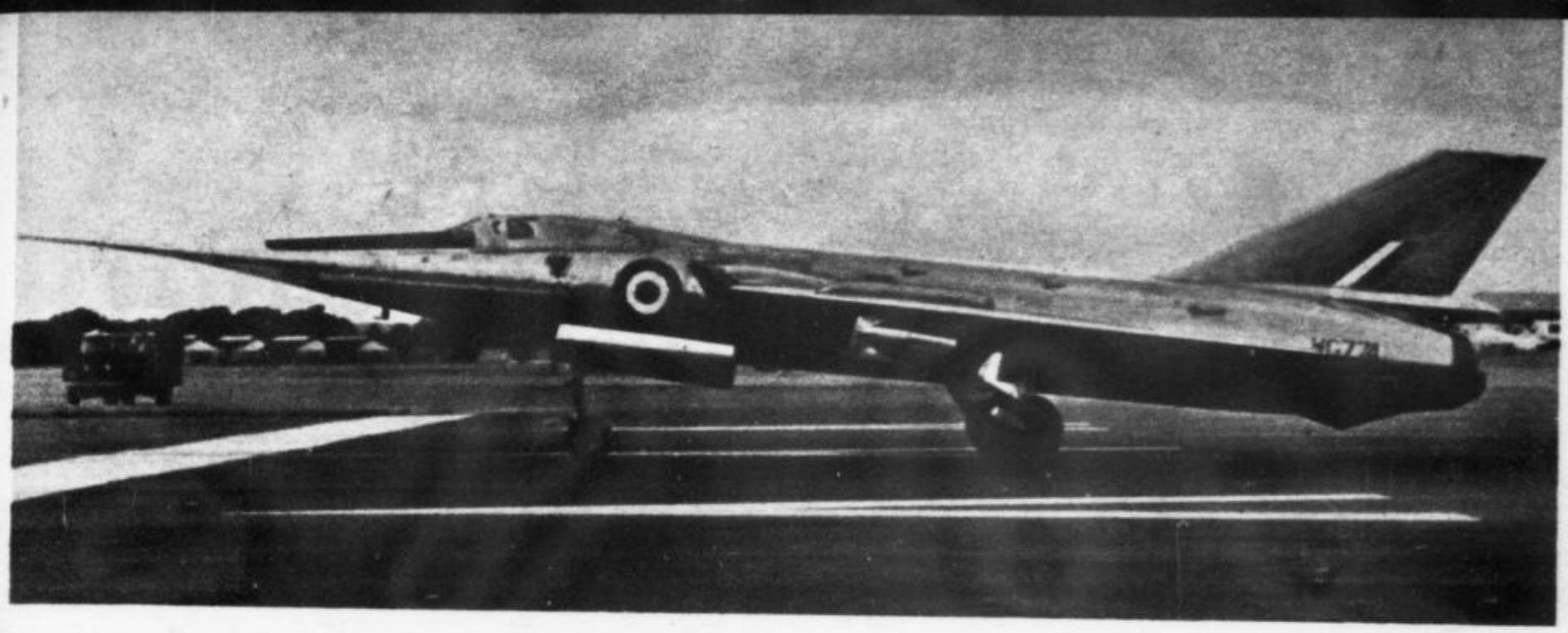
IT'S NEW!

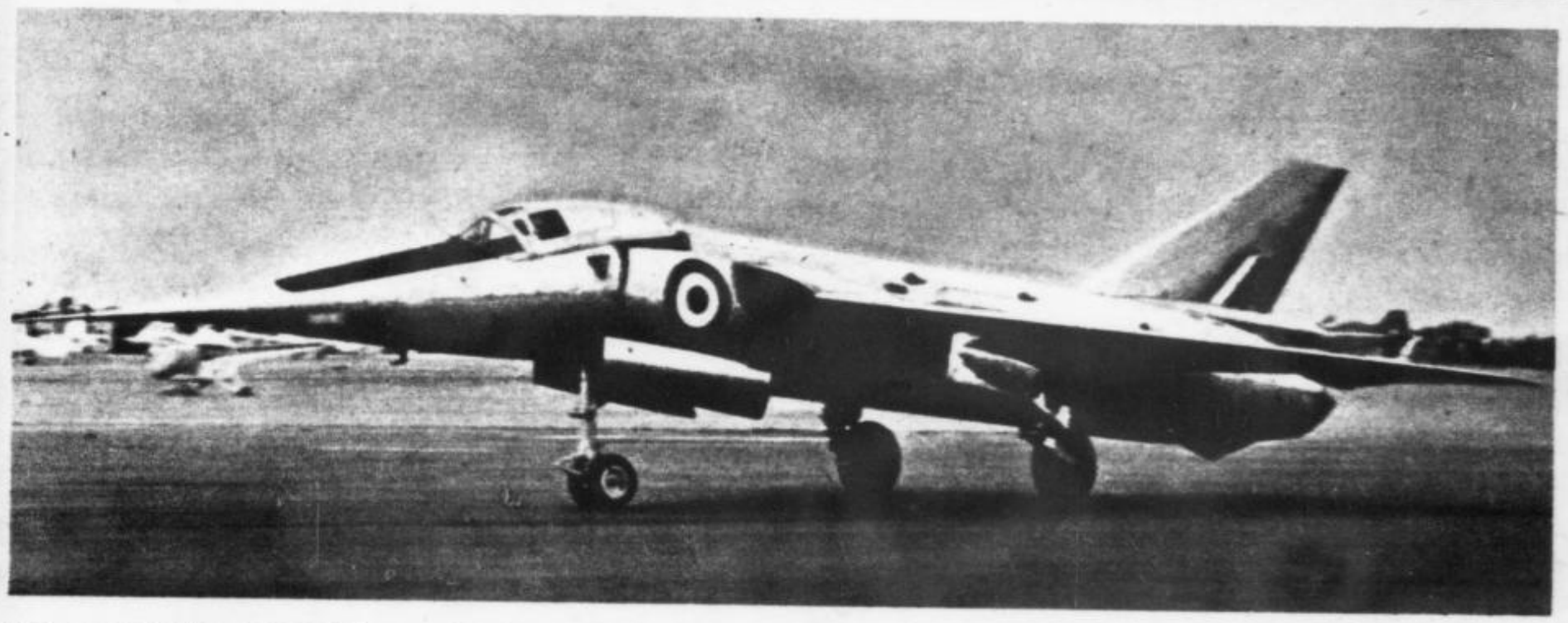


WHEELED SHIELD (below) for Detroit cops protects men in blue against rioters and gunmen. Police fire through the portholes.



FLATFOOT VERSION of 65-lb. armored plate protector has spotlight on top, leggings. Portholes are made of bulletproof glass.





DROOP SNOOTED Fairey Delta 11, British jet piloted by Peter Twiss, set new 1,132 mph world's speed record. Nose drops, bottom, for better view when landing, taking off.

QUADROTOR prototype, first four-rotor 'copter since '23, hovers, flies at 50-mph.

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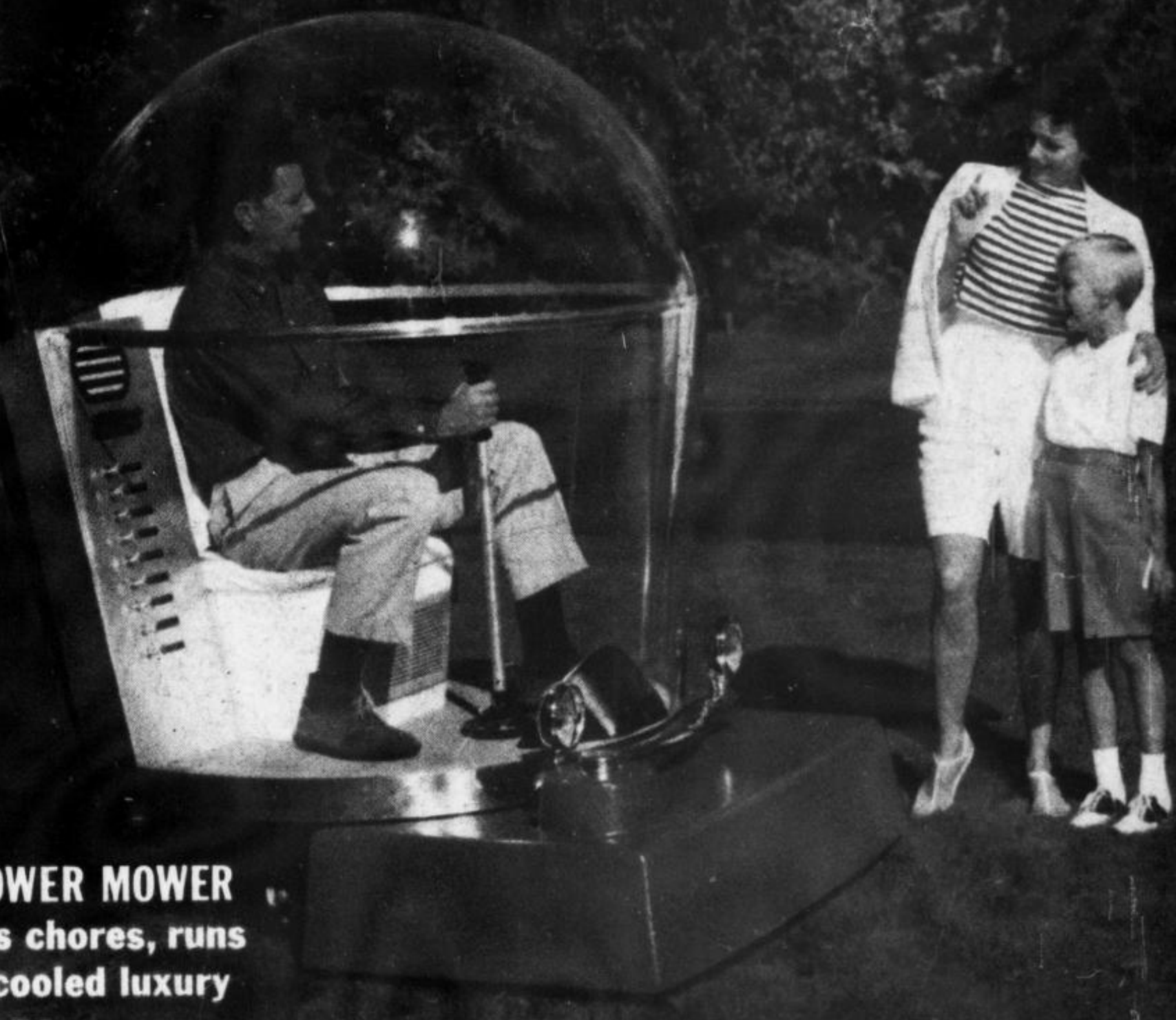

ZY MAN'S POWER MOWER

ds lawn, does chores, runs
ands in air-cooled luxury

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BUILD MODEL STEAM CAR—BE A PARLOR HOUDINI

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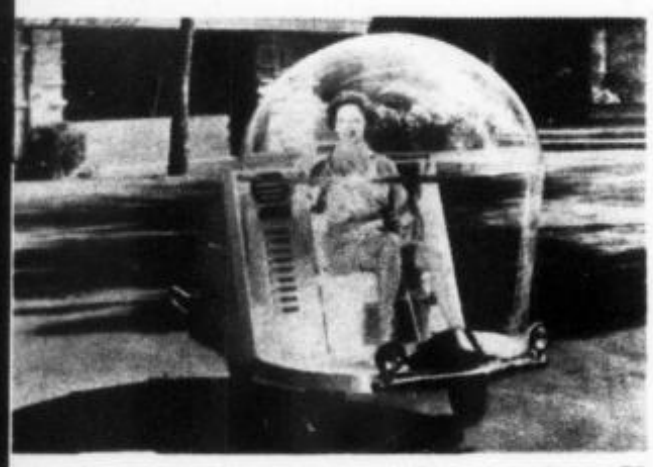

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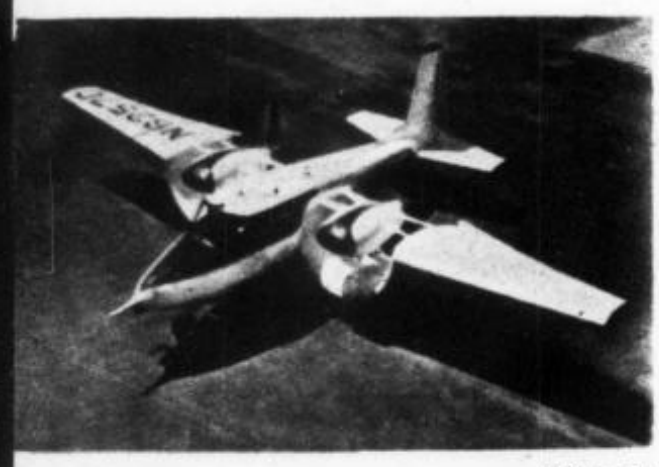

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LABORATORY I

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FRANK TINSLEY '57

Y IN OUTER SPACE

By Frank Tinsley

MANNED SATELLITES, to be up by 1965, will be built (left background) and serviced by ferry rockets that can reenter the atmosphere, land.

FOLLOWING the first satellites and the perfection of manned rockets that can re-enter the atmosphere and land, the third major step into space will be the space laboratory. In this manned station we shall be able to study conditions in space and to push back the limits of our atmosphere—fog-

ged astronomy. The lab, which should be in orbit by 1965 according to some authorities, will rotate about the earth as it revolves on its central axle-like spindle, creating an artificial gravity field. It will be built in orbit by ferry rocket crews. The third stage of their rockets will be powered by a solid fuel that can be stopped and started at will. Prefab panels will nest in the rocket bodies about the central fuel cores. Pilot and building crews will ride in the nose compartments. After the station is built, rockets will serve as service and supply ferries.

Let's suppose the space lab is up there—and somehow we've wangled a trip in a ferry rocket.

Our approach has been nicely calculated. After veering and braking with nose rockets we hang vertically in the shadow of the satellite, our rocket nose cone just below the trumpet bell of the dock. The station's electromagnets switch on and our ship noses gently into the receiving tube. Up we slip, never touching the dock sides, until our fluted nose locks in its seat with a barely perceptible jar. Slowly, our ship begins to rotate on its longitudinal axis until its spin matches the speed of the hub. Then the hatchways are thrown open and we see the Docking Officer grinning down at us.

The slightest push on the rocket cabin floor sends us floating up through the nose hatch into the satellite. We emerge into the large, well-lighted hub chamber, its expanse of cylindrical wall broken by circular hatches leading to the four "spokes." One of these is open and through it we see into a tiny, self-service elevator poised snugly at the top of its shaft, ready for the supplies the technicians are helping the pilot to unload. The supplies are packed in long, pie-section containers, designed to fit the ferry rocket neatly. They float upward at a touch, are guided by fingertips into the elevator. There, the magnetized floor holds them securely.

As the little lift makes its first trip out to the rim, we seize the opportunity to take a look at the observatory. Unlocking the airtight door, the Docking Officer volunteers to act as our guide. He calls our attention to the hatchway between the spinning hub and the static observation tower. A deep circular coaming revolves inside the tower opening so we can float through without the slightest danger of being pinched between the two. The lower deck of the tower is an astronomical lab, fitted with photo and mapping equipment, electronic calculators, etc. The technician on duty shows us around the tiny cubicle, pointing out photos of incredible clarity.

Ascending to the deck above, we find ourselves in a unique observatory. It is enclosed in a ball-like shell, mounted in a socket so it can move in any direction. The telescope, capable of minor adjustment in its fixed cradle, can be locked on a given star and be held there throughout the satellite's orbit by electonically-controlled movements of the shell. In the airless vacuum of space, neither weather nor atmosphere exist to distort the lens. Pictures of the most distant galaxies come through in sharp detail.

Returning to the hub chamber, we board the elevator and move out to the living quarters in the satellite's rim. Doffing our spacesuits, we emerge in an air-conditioned corridor flanked by staterooms. Here we walk about easily in the artificial gravity created by the satellite wheel spinning about its axle. Power is provided by photon rockets drawing their energy from solar batteries which fill the four wedge-shaped spaces between the wheel spokes.

To permit precious privacy, there is a stateroom for each member of the crew. Each is [*Continued on page* 183]

SPACE STATION. 1. Electronic eye keeps station facing sun. 2. Polar mirror generates power, shades telescope. 3. Observatory rotates in socket. 4. Astronomical lab. 5. Tubular dock. 6. Photon power units. 7. Unpressurized hub. 8. Crewmen unloading ferry. 9. Supplies go from ferry to elevator. 10. Hatchway to observatory. 11. Spokes hold elevators, stairs. 12. Cross bracing holds solar battery field. 13. Gravitized living area. 14. Tubes of algae make oxygen. 15. Individual quarters. 16. Labs. 17. Promenade.

Design Features of MI's Space Laboratory

GYROSCOPES KEEP OBSERVATION TOWER SPINDLE ALWAYS STATIC

CENTRIFUGAL ACTION BY ROTATING RIM SIMULATES GRAVITY

SIDE VIEW OF SATELLITE

TOP VIEW OF SATELLITE

SUN

EARTH

SIDE VIEW OF ROLLER-BEARING HUB AND CENTRAL COMPARTMENT

SECTIONAL VIEW OF ROTATING RIM SHOWING LIVING QUARTERS

65

FRANK TINSLEY '57

COVER STORY

LUXURY MOWER OF TOMORROW

IT'S called the Wonder-Boy X-100. It looks like it came from outer space and while it is only a prototype, it promises to be your yard mechanic of the future.

Designed and built by the Simplicity Manufacturing Co. of Port Washington, Wis., this luxury mower of tomorrow has a 54-in. plastic-bubble cockpit that is air-conditioned and will make it possible to manicure your lawn in any kind of weather.

Wonder-Boy will mow your grass, feed it, weed it, spray for insects, plow snow, haul equipment and provide handy power take-off for garden chores. It can also be used as a golf cart. The unit is designed as a vehicle for short-run highway travel without its mowing attachment.

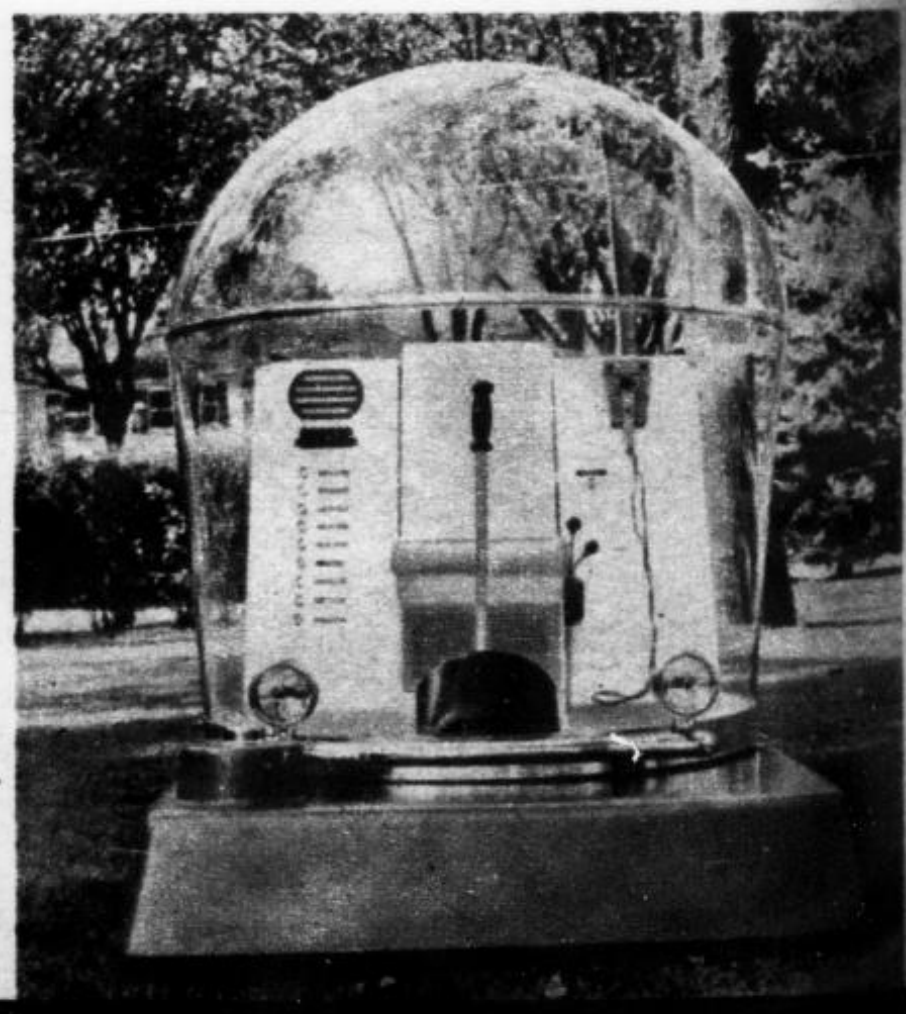
The futuristic model weighs close to 500 lbs. It has an overall length just under nine ft. and stands six ft. high. Powered by a 10-12 hp Briggs-Stratton

EVERYBODY will want to get in the act and Dad will have to fight to mow the lawn.

WONDER-BOY X-100, without mowing attachment, can be used for highway runs.

BUTTONS operate radio-telephone, lights, seeder, host of other chores vehicle does.

JOY STICK steers and brakes mower which is easy to handle, comfortable and safe.



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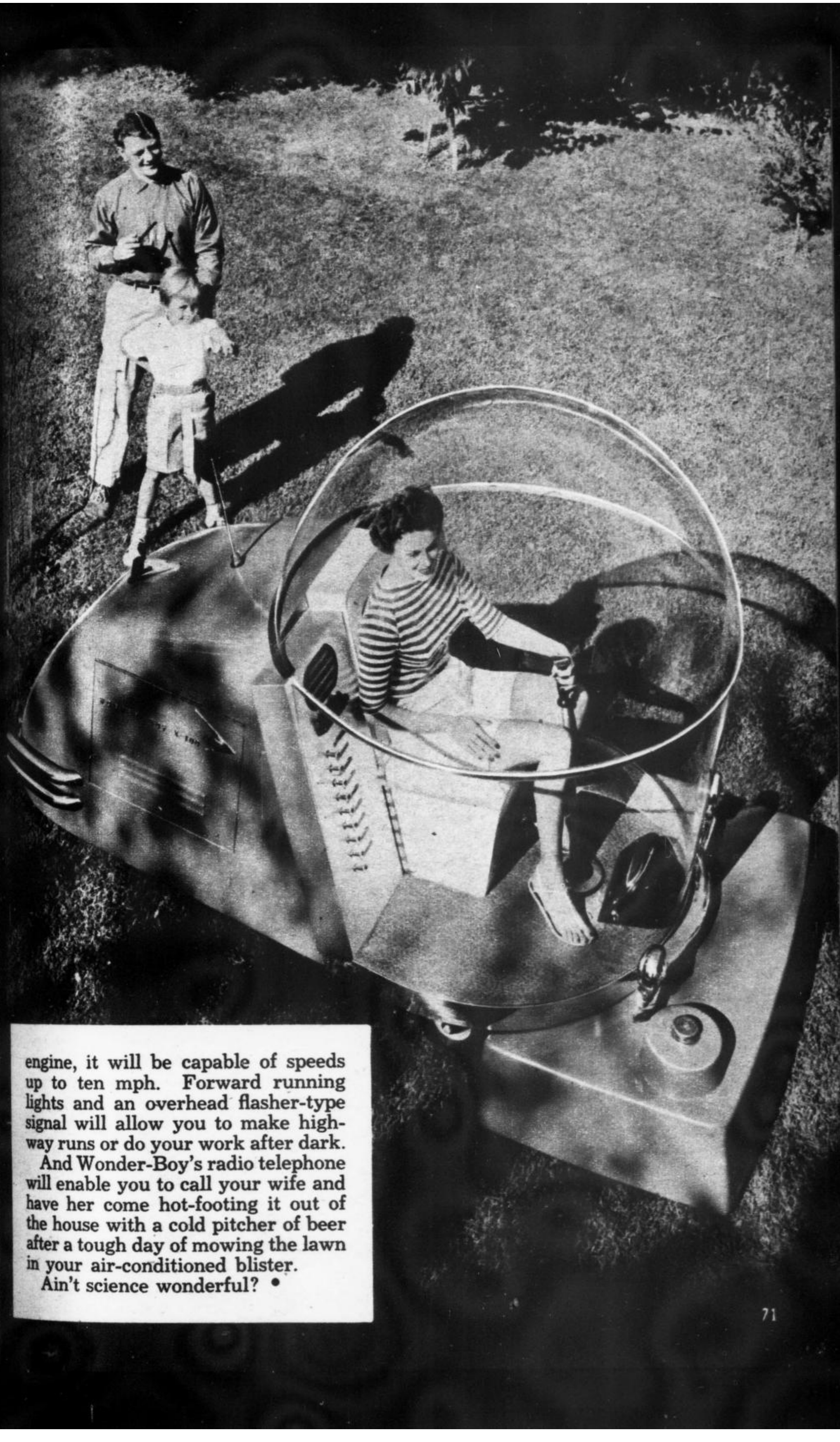


engine, it will be capable of speeds up to ten mph. Forward running lights and an overhead flasher-type signal will allow you to make highway runs or do your work after dark.

And Wonder-Boy's radio telephone will enable you to call your wife and have her come hot-footing it out of the house with a cold pitcher of beer after a tough day of mowing the lawn in your air-conditioned blister.

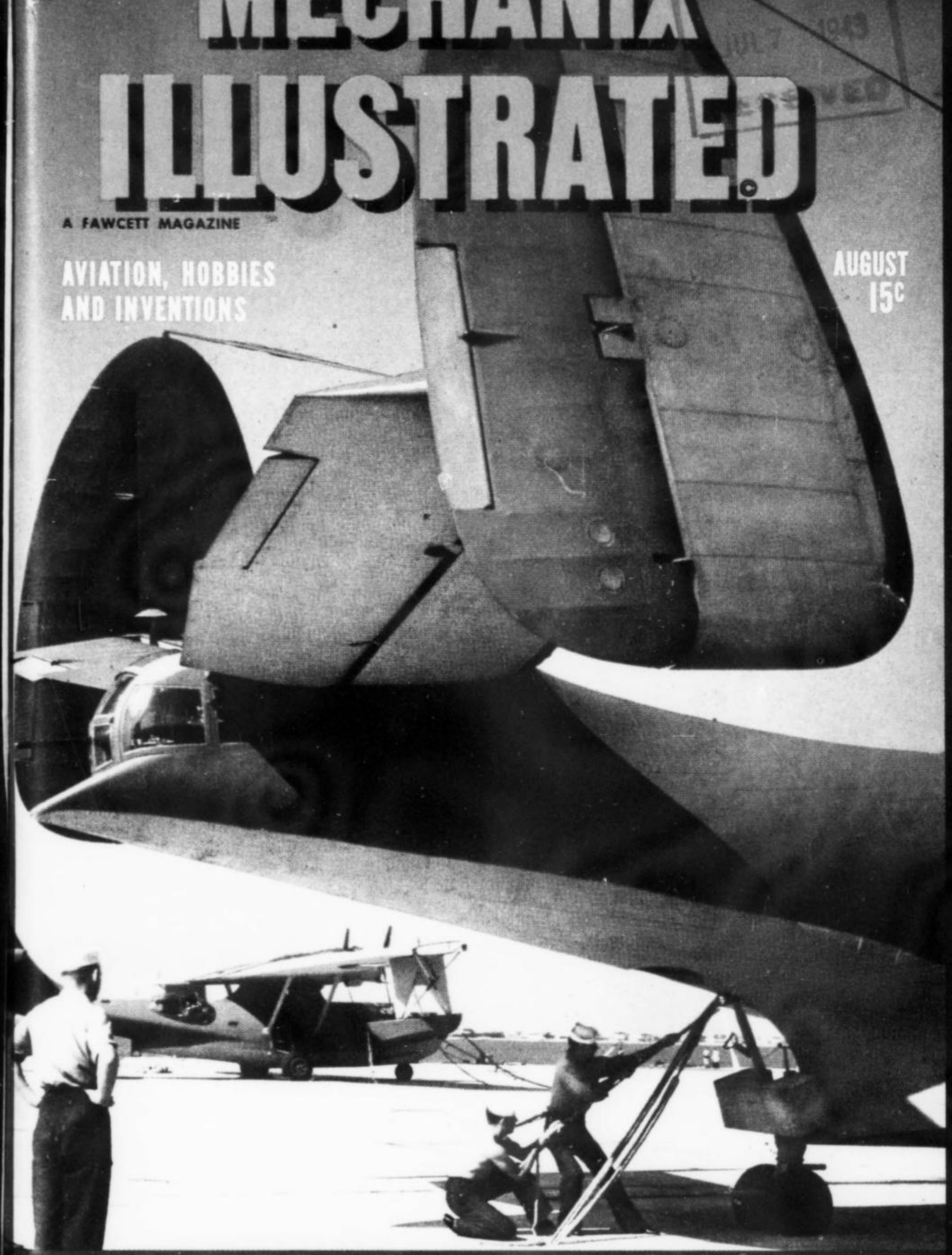
Ain't science wonderful? •

MECHANIX ILLUSTRATED©

A FAWCETT MAGAZINE

AVIATION, HOBBIES AND INVENTIONS

AUGUST 15c



FLYING THE WORLD'S FASTEST BOMBER

BY ARCH WHITEHOUSE

SEE PAGE 50

AUGUST 1943

MECHANIX ILLUSTRATED

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SPECIAL FEATURES

On the Cover: Two of Uncle Sam's great flying boats, back from long patrol sweeps off U. S. shores, get a checkover at their base. In foreground is the huge double-ruddered tail of a Martin PBM Mariner; plane in background is a Catalina PBY. Official U. S. Navy kodachrome.

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NEXT MONTH!

"The first time you're under diving Stukas, you're scared clean out of your skin." That was the reaction of more than one American soldier who ran into real battle for the first time when he met the veteran German Afrika Korps in Tunisia. Though the Americans proved themselves better fighters than the German Army's best, they had no walkover. In the ebb and flow of battle for the vital passes through the Tunisian hills, the fighting was tough and deadly. For a stirring report of what it was like, don't miss I was Wounded At Faid Pass, by Corporal S. A. Davis, in the September MECHANIX ILLUSTRATED!

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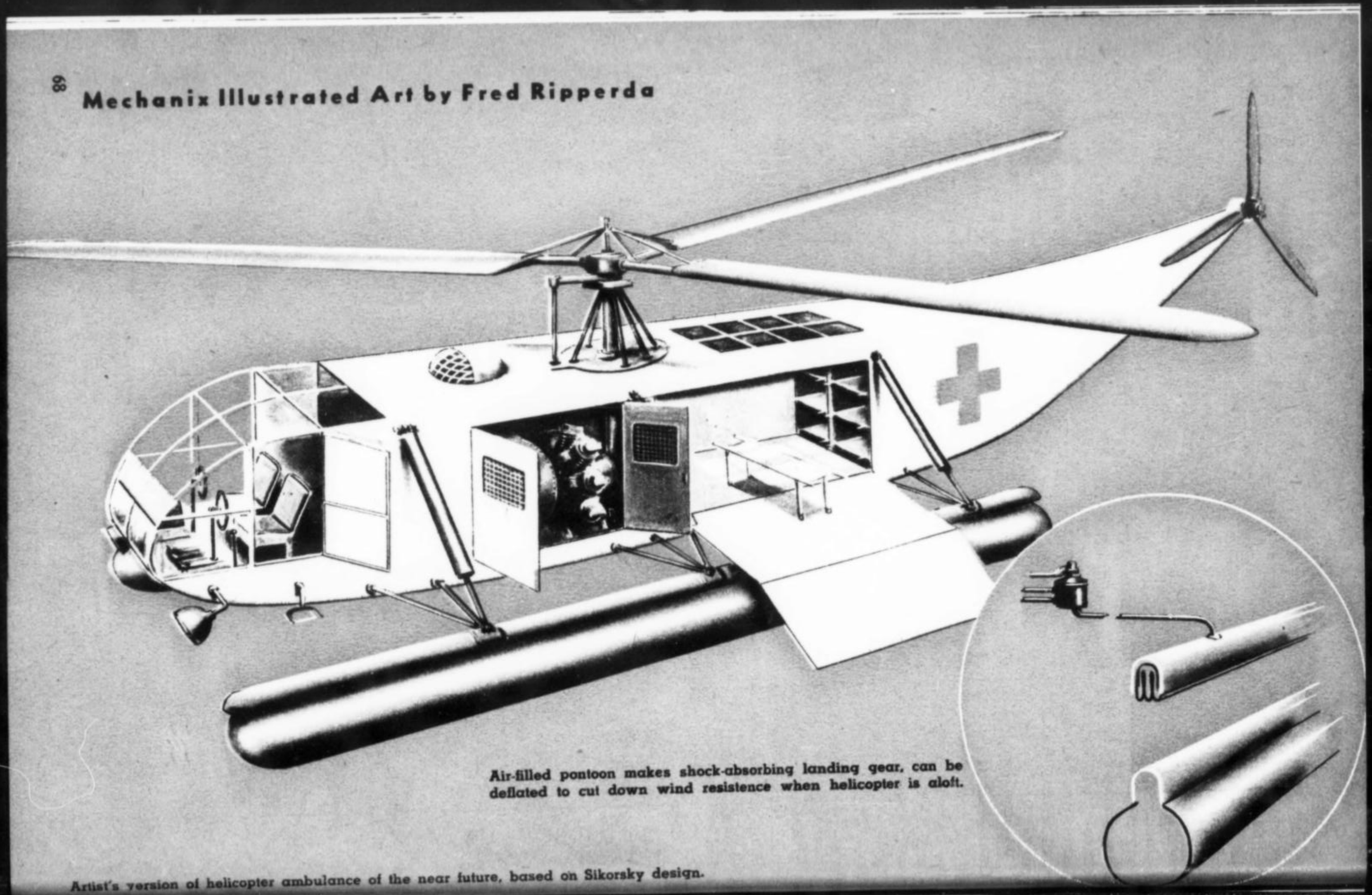
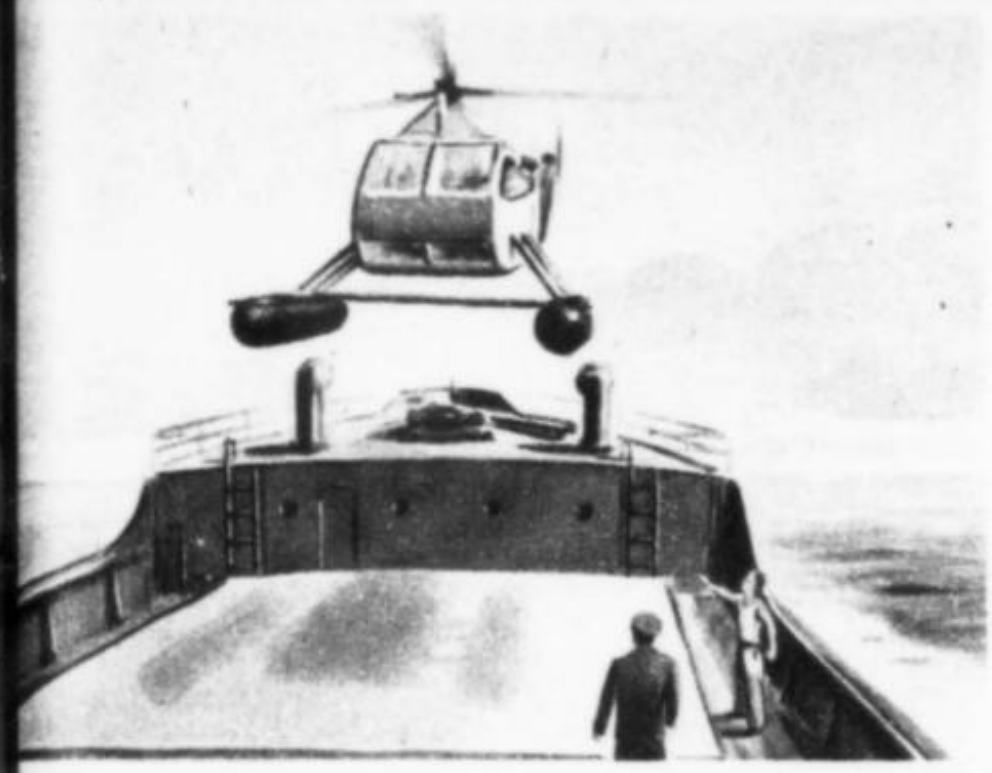


Air-filled pontoon makes shock-absorbing landing gear, can be deflated to cut down wind resistence when helicopter is aloft.

Artist's version of helicopter ambulance of the near future, based on Sikorsky design.

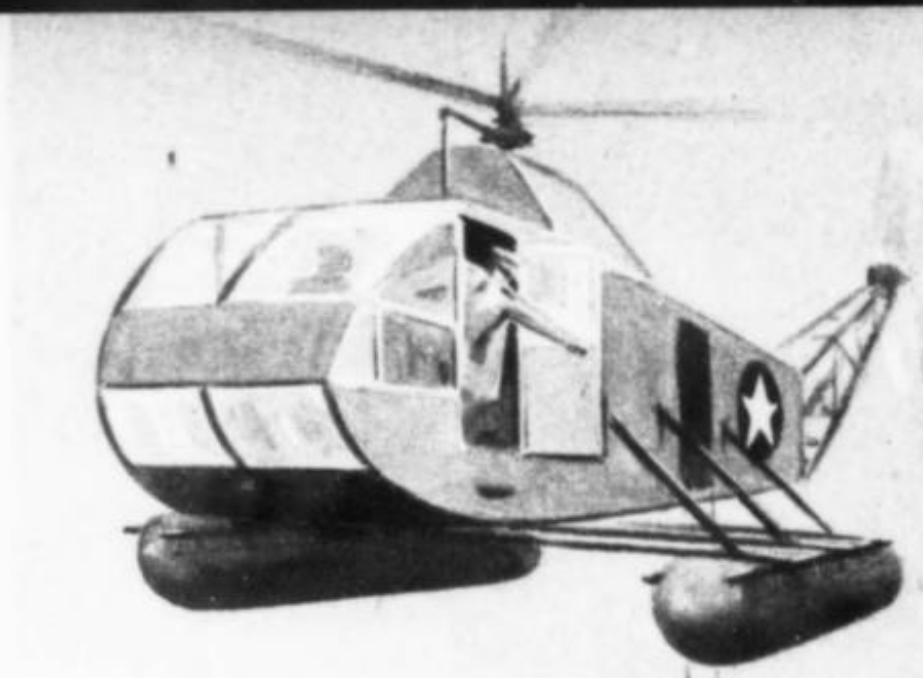


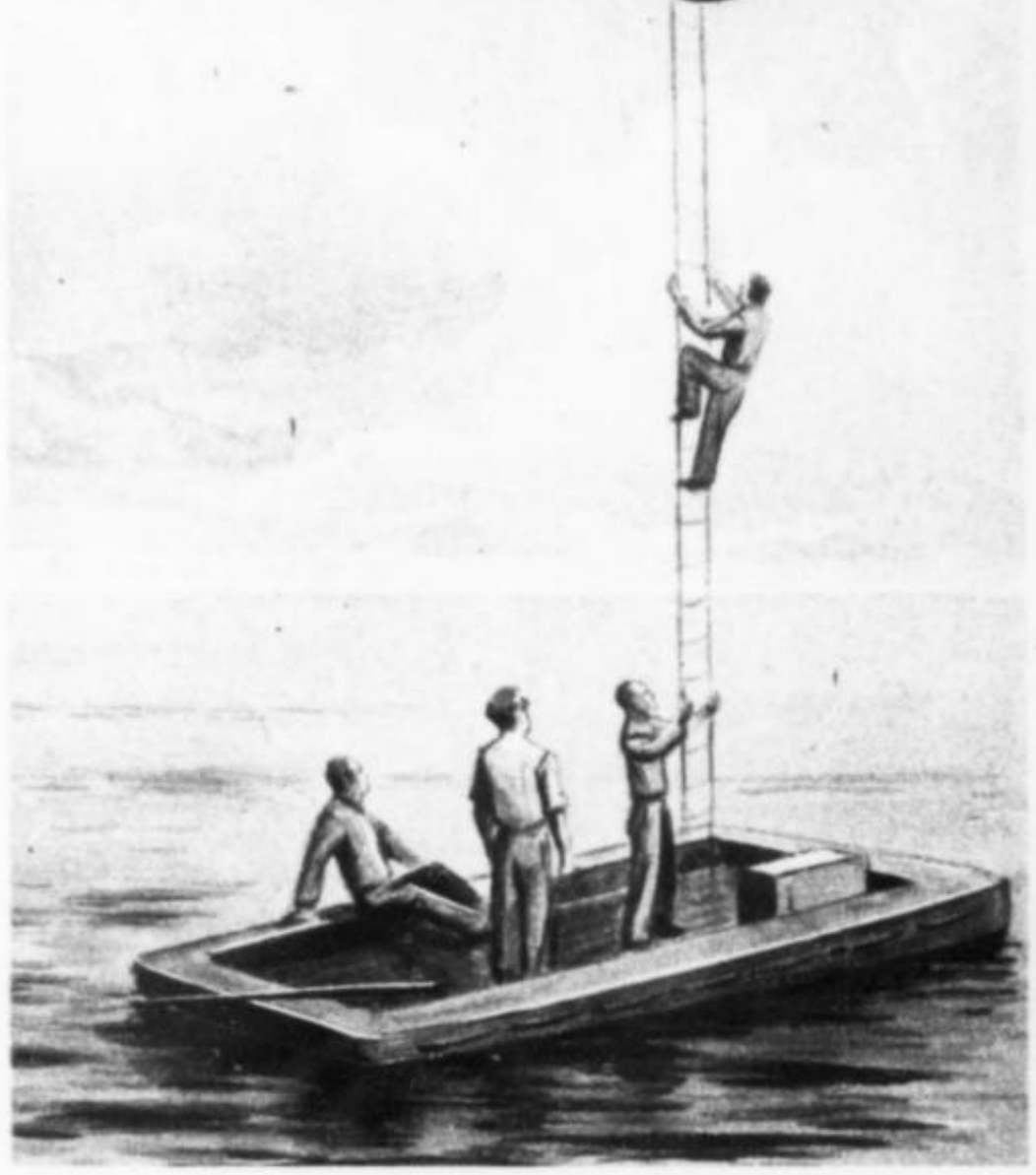
The deck of a freighter provides ample landing and takeoff area to accommodate a sub-spotting helicopter.

POSSIBLE HELICOPTER WAR USES

WHILE many uses to which the armed forces will put the Sikorsky helicopter are subject to censorship, those illustrated on this page are ideas which have been put forward in public. The Navy has announced that helicopters are being flown from decks of ordinary merchant ships to patrol a 600 mile gap in mid-Atlantic which regular planes cannot efficiently cover. England and Canada are also using helicopters.

For wartime communications, helicopters can lay telephone wires across impassable swamps, snow.





Even in rough water, helicopters can effect rescues at sea, saving raft occupants without landing.

Flying at speed of sub, a helicopter can depthbomb with deadly accuracy, hover to make sure of kill.

MATTER--INSIDE OUT

by Willy Ley

SOMETHING fell out of the sky.

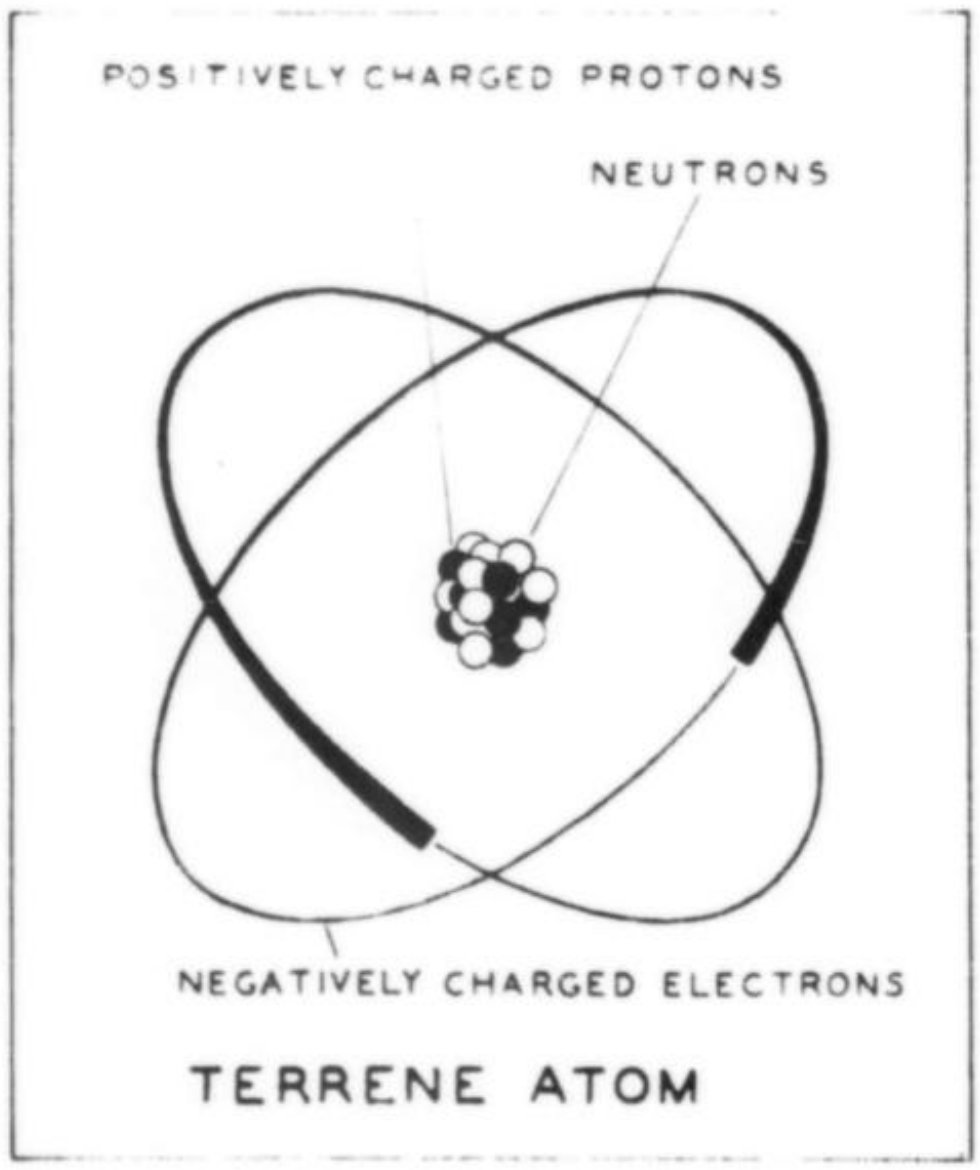
September 14, 1940, was a clear day. In the 22-foot cutter-type sailboat Rockit II on that day, three adults and a child, as reported in the New York Times of September 15, were cruising on Long Island Sound about ten o'clock in the morning. Then, suddenly, something fell out of the sky into the water, and exploded.

"The screech came first—an unholy noise, and a split second later, the explosion, about two points off the starboard bow. It blew up a great tower of water, twenty or thirty feet in the air. It was the strangest thing in the middle of that peaceful Sound. Why, there wasn't even another boat in sight, and not an airplane overhead!"

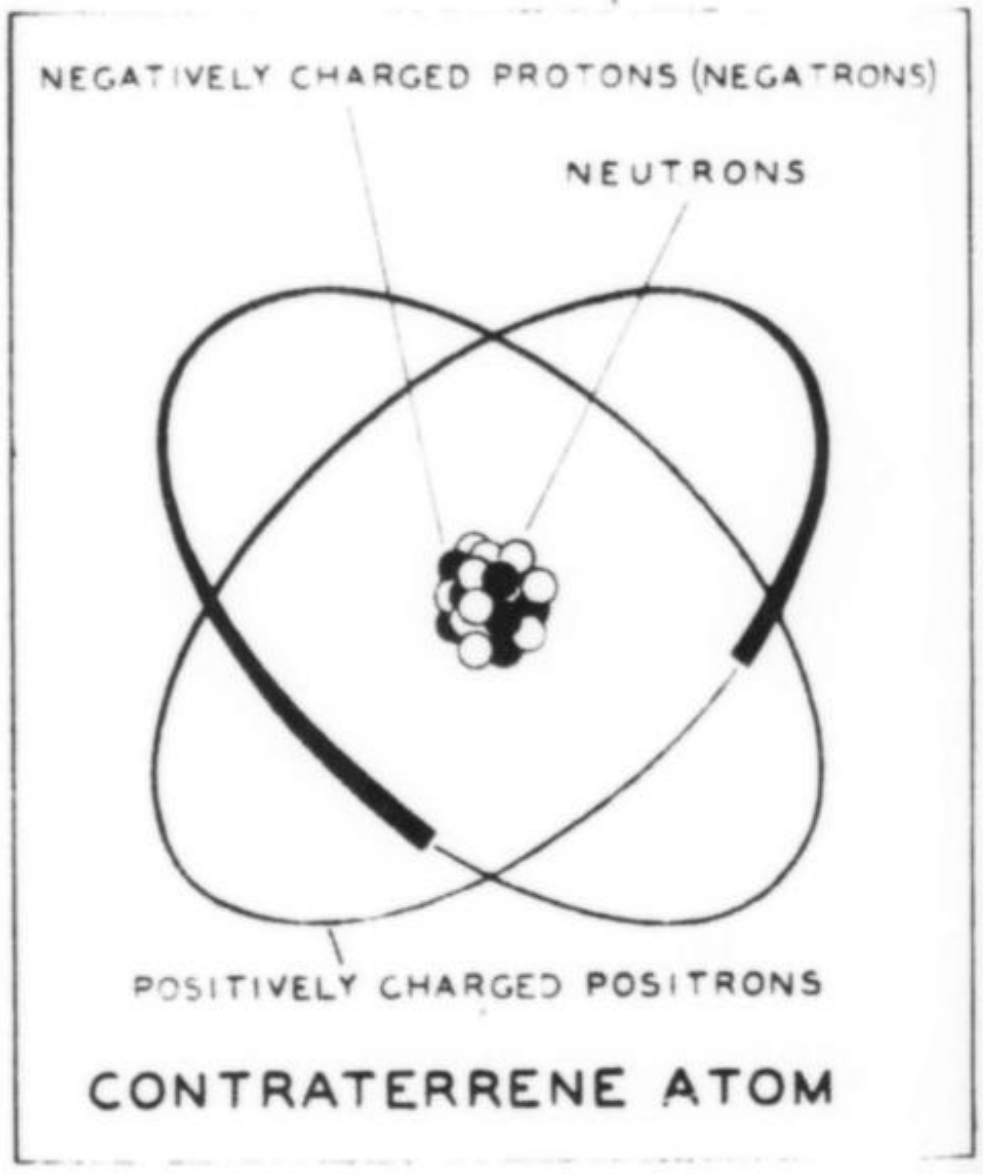
What could the thing have been? The people's first thought was that artillery practice must be going on at one of the near-by forts. Inquiry disclosed, however, that no military unit had engaged in artillery practice in that area on that day Perhaps, then, it was a meteorite. But "it was said at the Hayden Planetarium that a meteorite on striking water would not explode."

What could the thing have been, that fell out of clear space into the quiet Sound, and exploded like an artillery shell? No one can say with certainty. Aided by a hypothesis which has recently come into wide acceptance, however, scientists can now put forward a complete, though startling, explanation. This explanation is rooted in the idea that there exists a totally new kind of matter, different from any we have ever known.

Sir Arthur Eddington once said about astrophysical research that science tried to delve into the interior of a star and suddenly found itself in the interior of the atom. That remark referred to the necessity of exploring atomic structure first until it became possible to explain the composition of certain stars



Ordinary atom has Positively Charged Nucleus.



Contraterrene atom has Negatively Charged Nucleus.

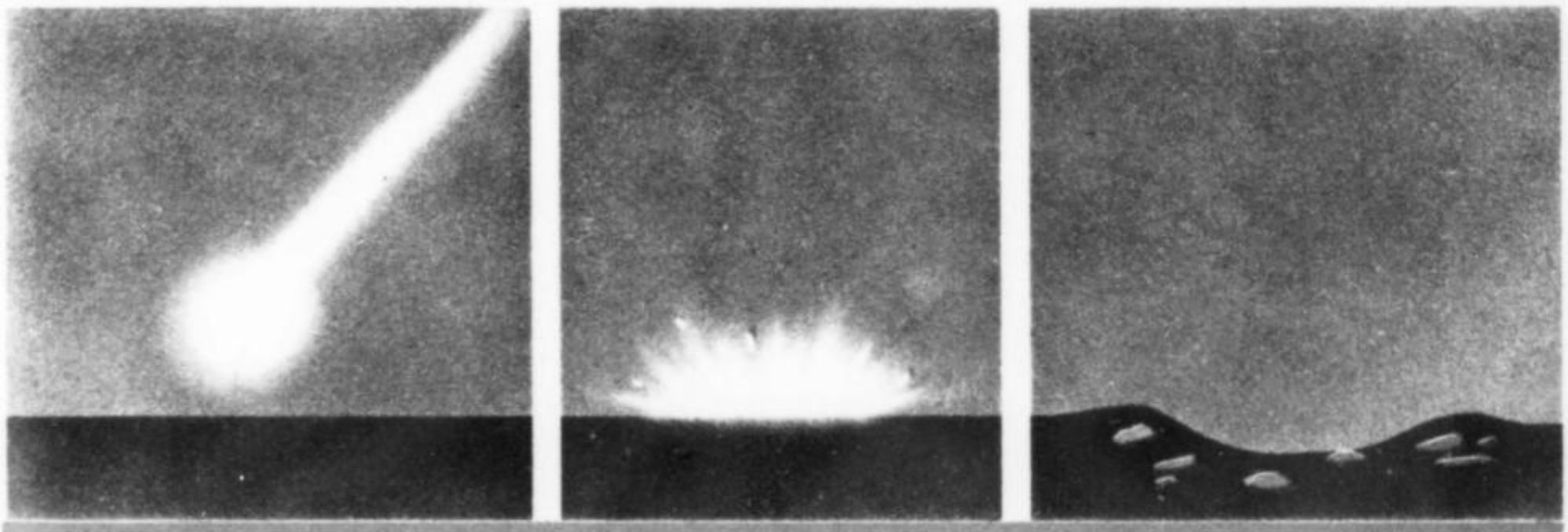
and the functioning of stars in general. It is likely that Sir Arthur's remark applies to meteorites too; before some mysteries connected with meteorites could be explained it became necessary to conceive a new type of atomic structure.

The word "atom" really means "indivisible," but our scientists have succeeded in chopping the atom up into a number of different particles. Every atom consists of a nucleus circled by one or more electrons—only one in the case of hydrogen, two in the case of helium, and so forth. These electrons are arranged in various layers or "shells." Each electron carries a negative charge and is of very small mass which is called "one." The nucleus of the atom consists of protons and neutrons, each being of about the mass 1840. The proton carries a positive electric charge: the neutron, as suggested by its name, is electrically neutral. Research has established that there is also a sub-atomic particle of mass 1 with a positive electric charge, the positron, and there is some reason to believe that there is also the neutrino, of mass 1, without any electric charge.

Thus we have three light sub-atomic particles of the mass 1—the negatively charged electron, the positively charged positron and the neutral neutrino. And we have two heavy particles, the neutral neutron and the positively charged proton. The question whether there is such a thing as a negatively charged heavy particle called, say, negatron, remains to be answered. Theoretically there is no reason to doubt its existence, but as a matter of fact the negatron has not yet been found.

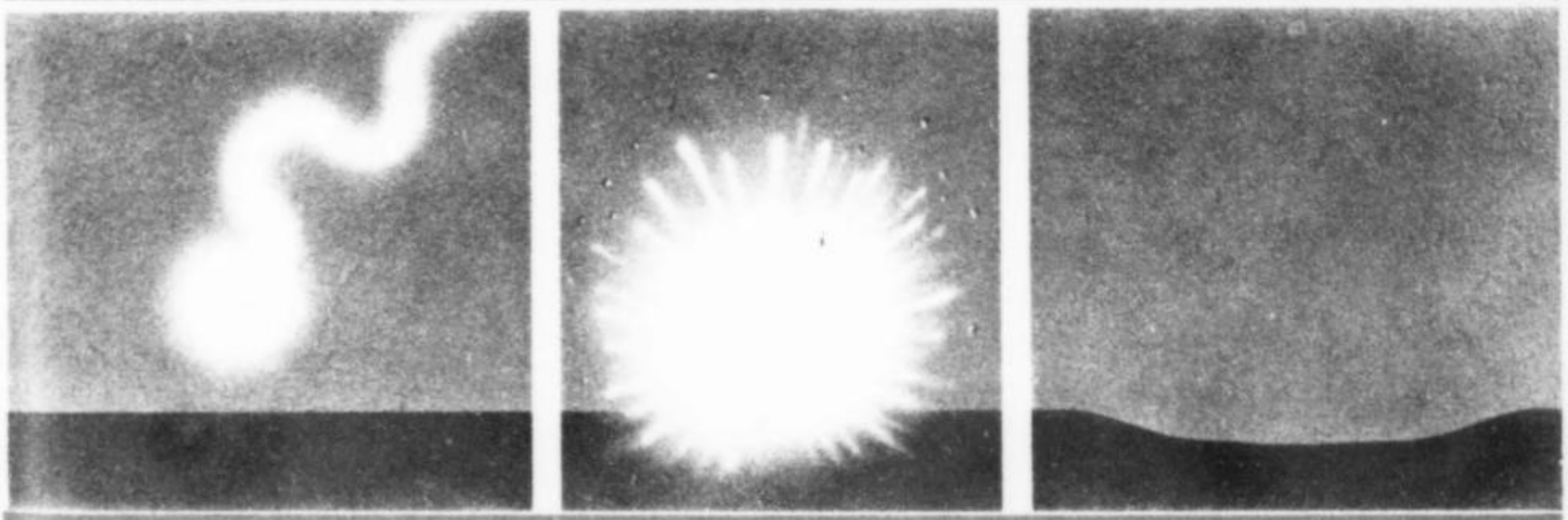
Atomic theory, however, supplies a good reason for that: a negatron would be very

FALL OF A NORMAL METEORITE



Smooth, even earthward path. | Low-profile contact flash. | Deep crater, meteoric rocks.

FALL OF A CONTRATERRENE METEORITE



Zig-zag course downward. | Dazzling contact explosion. | Flat crater, no meteoric rock.

—Photo by Dr. Clyde Fisher

Looking down into Arizona's Meteor Crater. Not contraterrene-caused, this crater is deep, has meteoric rocks.

—Fairchild Aerial Surveys Photo

Oval Bays near Mullins, S. C. No meteoric fragments here. Shallow craters possibly caused by contraterrene meteors.

difficult to find because it could exist for only an infinitesimal fraction of a second under normal conditions. Like a proton, a negatron would have the tendency to form a complete atom, with other negatrons and neutrons in the nucleus and positrons instead of electrons in the surrounding shells. Given a sufficient number of negatrons, neutrons and positrons the whole series of 92 elements with all their isotopes, with decay of the heavier elements, with the same chemical reactions among one another, the same compounds and the same possibilities of alloying could be formed. It would be a complete set of elements with a complete chemistry—but it would be reversed matter, matter with positively charged "shells" and negatively charged nuclei. This theoretical set of elements has been called *contraterrene matter*, as distinct from the ordinary or *terrene* matter we know, the matter that consists of atoms with electrons revolving around positively charged nuclei.

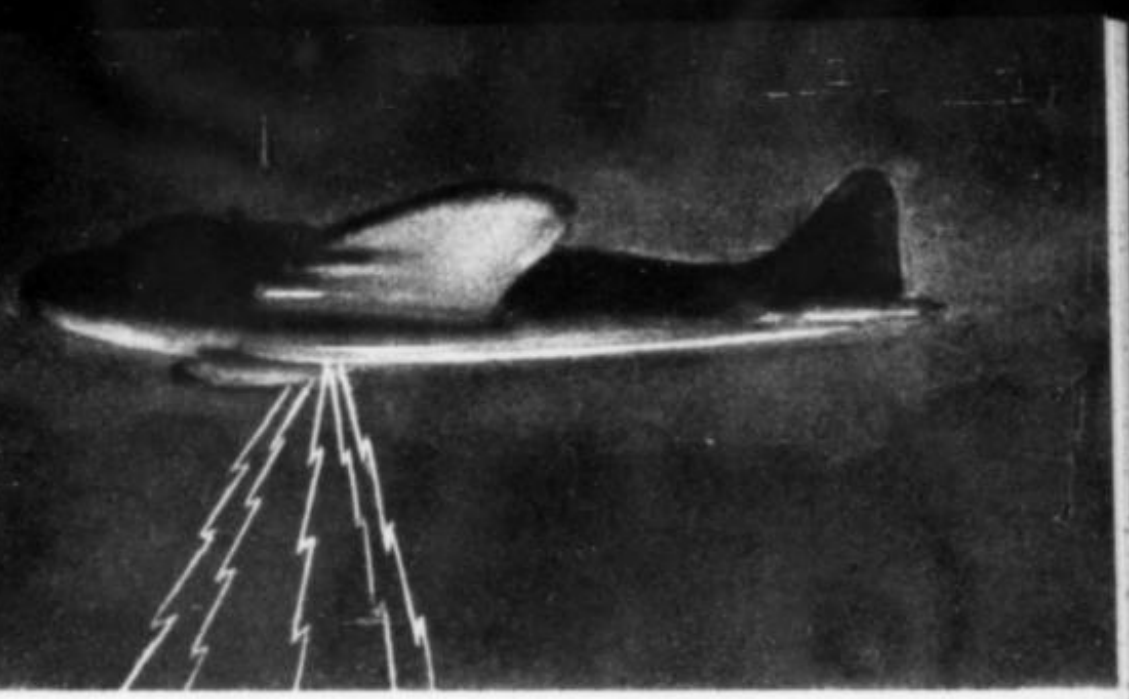
The two types of matter, fundamentally different, mutually exclude each other. If, say, a contraterrene helium atom touched an ordinary or terrene helium atom both would be utterly and instantly annihilated. The nuclei of the two opposed types of helium atoms consist of four heavy particles each, two neutrons in each case plus two protons in terrene and two negatrons in contraterrene matter. The terrene helium atom has two electrons, the contraterrene helium atom has two positrons.

The protons and the negatrons in the nuclei and the positrons and the electrons in the shells would just destroy each other; the two atoms would both flare up into a burst of gamma radiation with eight left-over neutrons as "ash."

For this reason negatrons which might spring into existence under certain conditions would be so short-lived that they would be exceedingly difficult to detect, even if it were known where and when to look for them. By the same token a proton and a terrene atom would not last longer than the time required to destroy them in a world built of contraterrene matter. Both forms of matter are equally possible and equally stable—as long as they do not come into contact with each other. Without physical contact it would be absolutely impossible to tell which is which, for terrene and contraterrene matter would look exactly alike to the eye as well as to the telescope, the camera and the spectroscope.

That implies that we can never know whether a world that is caught in the telescope or with the photographic camera is terrene or contraterrene in its fundamental construction. This does not apply to the other planets of the solar system, for since all planets are children of the sun, and if the earth consists of proton-electron matter the other planets and the sun itself must necessarily be of the same type of matter. But we cannot be sure of Sirius or Betelgeuse and we have good reason to be doubtful about some of the comets. [*Continued on page* 158]

IN BED
PART II



plane or helicopter, it just simply won't let you take part in a collision of any sort. It operates in a similar manner to the device in Britain's present-day night fighters, and when applied to the flivver ships of tomorrow it will render careless fliers harmless even if they are sound asleep at the controls.

If, for example, you doze a bit as you fly home from a late party, and a stream of cross-country express planes happens to cross your path, this intelligent instrument will probably awaken you with a bong and some flashing lights on the dash panel.

Or if you prefer a more courteous manner on the part of your aircraft instruments, it may make use of a loudspeaker in the ship's cabin, to announce. "Pardon me, pilot, but there seems to be something in our way—hold on tightly, please!"

If you persist in giving a deaf ear to its pleadings it will take control of your ship itself, and see you safely home. This is no mere prediction, as Jack Hammond doesn't make predictions. He tells of his inventions only after they have been successful in one form or another, or when all their components have been satisfactorily tested.

"If I were to predict a radio that would bring you a news program when you press a button marked 'news'—or a concert when you press another button with the label 'classical music,' I might be called a crack pot," Inventor Hammond told us. "But we have already developed such a radio in the laboratory, so I can safely say it is possible."

Inventor Hammond explained that the need for such a radio first occurred to him during

Artist's version of Hammond radio-controlled dive bombers in action. After raid they escort master ship.